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ROYAL BOTANIC GARDENS, KEW

XIV—SOME INDIAN RHODOPHYCEAE ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY. III.*

F. Boergesen.

Bangiaceae.

Goniotrichum elegans (*Chauv.*) *Le Jolis*, Alg. mar. Cherbourg, 103; Berthold, Bangiaceen, 26; Rosenvinge, Mar. Alg. Denm. 75. —*Bangia elegans* Chauvin, Mem. Soc. Linn. Norm. t. 6 (1838), not seen.

A common epiphyte upon various algae. The thallus near the base is 27μ thick, at the summit of the branches 12–15μ.

India: Dwarka, Tuticorin.

Distr. Seems to occur in most temperate and warm seas.

Chantransiaceae.

Acrochaetium Iyengarii *Boergs.* sp. nov.; *A. caespitiformi* Boergs. proximum, quod tamen a specie nostra nova praeter alia filamentis tenuioribus et magis ramosis, sporangiis in ramulis positis, pilorum absentia differt.

Thallus caespitosus, usque ad 1 mm. altus e disco basali, in filamentis hospitis epiphyticus et e filis erectis ramosis compositus. *Discus basalis* valde expansus, unistratosus, e filis repentibus horizontalibus confluentibus, cellulis brevibus, 6–7μ longis, 5–6μ latis, constructus. *Fila* erecta, in parte basali simplicia, in superiori parte plus minus sparsa aut unilateraliter ramosa, ramis brevibus, simplicibus aut paucis ramulis instructis. *Pili* hyalini, breves, terminales, 60μ longi et 2·5μ lati adsunt. *Cellulae* in filis erectis plus minus moniliformes, circiter 6μ latae et 15μ longae, chromatophorum parietale, pyrenoide laterali instructum continentes. *Sporangia* oblongo-ovalia, 8μ lata et 13μ longa, sessilia aut pedicellata, in latere ramorum secundatim disposita, rarius plus minus sparsa aut opposita.

India: Mahabalipuram (The Seven Pagodas) South of Madras, *Prof. Parthasarathy Iyengar* legit et dedit.

This grows in large tufts (Fig. 1) on *Chaetomorpha media*. The basal disc (Fig. 2a) is composed of the congenitally united horizontal filaments which are easily visible also in the older discs. The disc is about 6μ thick and the cells a little longer than broad. From the cells in the disc the erect filaments arise forming dense tufts up to

*Continued from *K.B.* 1932, 134.

about 1000μ (Fig. 1). The erect filaments are composed of cells somewhat moniliform, and as a rule they have no branches in the lower part (Fig. 1); in the upper part a few short branches, unilateral or scattered are often present. Many of the tips of the filaments end in short thin hairs (Fig. 1, 2c). The monosporangia (Fig. 2d, e) are ovate-elliptical, 13μ long and 8μ broad and most often sessile. Sometimes a few are found seriately together, sometimes more irregularly and rarely opposite.

The host-plant was growing in a very exposed place on rocks near the shore.

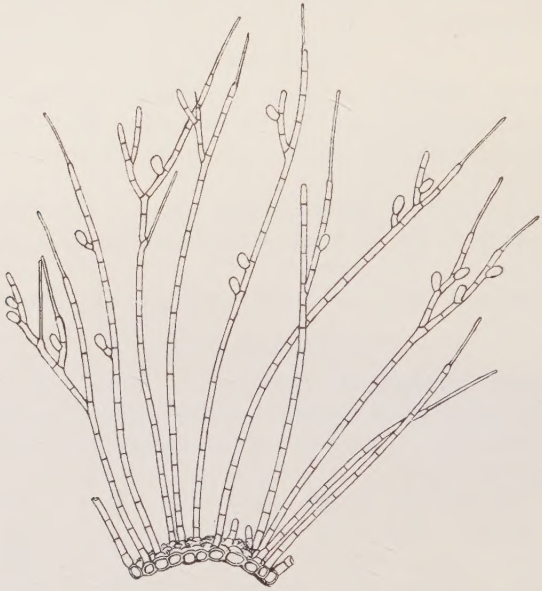


Fig. 1. *Acrochaetium Iyengarii* Boergs. (× 248).

BONNEMASONIACEAE.

Asparagopsis Sandfordiana *Harv.* in Trans. Ir. Acad. xxii. 544; Phycologia Austral. i. t. vi.

It is especially on account of its size, dark colour and geographical distribution that this species has been separated from *A. taxiformis* (Del.) Coll. et Herv. But, as pointed out by various investigators, both forms are closely related. A few almost ripe cystocarps were found. The plant was dredged at a depth of about 5–10 fathoms. Cystocarps were present in January.

INDIA: Dwarka; Karachi, *A. B. Kotwal* (Herb. New York Bot. Garden).

Distr. Tonga Islands, Australia, etc.

GELIDIACEAE.

Gelidium pusillum (*Stackh.*) *Le Jol.* List. Alg. Cherb. 139; Kütz. Tab. Phycol. xviii. 37.

The few specimens found formed dense low tufts upon exposed rocks in the littoral zone. The specimens were about 1–1½ cm. high and agreed with the description of var. *conchicola* Picc. et Grun. in Nuov. Giorn. Bot. Ital. xvi. 316 (1884).

India : Bombay : Malabar Hill.

Distr. West Coast of Europe, Mediterranean Sea, Red Sea, Malayan Archipelago, Japan, etc.

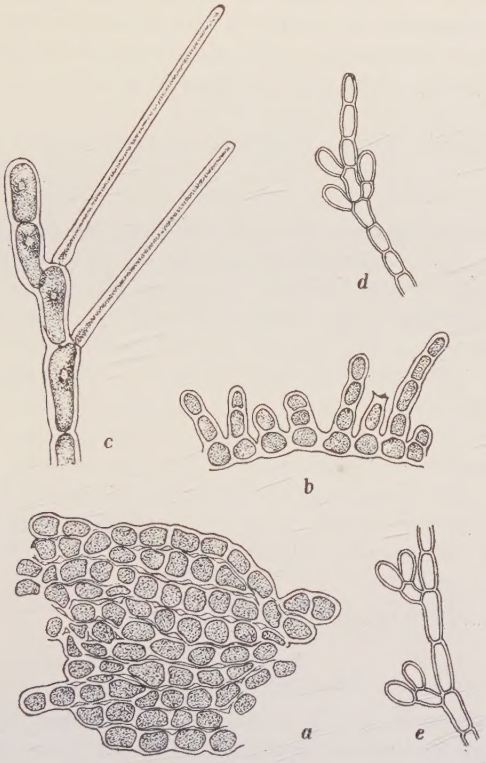


Fig. 2. *Acrochaetium Iyengarii* Boergs.: a, part of the basal disc; b, transverse section of disc with young erect filaments; c, upper end of filament with hairs; d, e, parts of filaments with sporangia (a, b, × 353; c, × 525; d, e, × 375).

Caulacanthus ustulatus (*Mert.*) *Kütz.* Phycol. Gener. 395; Spec. Alg. 753; Tab. Phycol. xviii. 8; J. Agardh, Spec. Alg. ii. 433; Bornet et Thuret, Not. algol. 55, t. 19.—*Fucus ustulatus* Mert. fide Kützing.

The Indian plant seems to agree well with *C. ustulatus*. I have compared it with specimens from various localities in the Atlantic Ocean and found that they agree well as to size and ramification of the thallus and size of peripheral cells, etc. The thallus of the Indian plant is 150–250μ thick and like the European plant has short attachment discs composed of coherent peripheral cells growing out

in all directions. The summits of the filaments are acute. According to the description (Liste des Algues du Siboga, 222) *Caulacanthus indicus* Web. v. B. is a much smaller plant with compressed fertile branches. In connection with Mme. Weber's remark that it differs from *Caulacanthus ustulatus* in its great number of discs, I may mention that I have found numerous discs in my Indian specimens and also in European and Canarian material.*

Tetraspores were found only in my material gathered in January. The plant is common on rocks in the littoral zone near Bombay, where it grows in exposed as well as in more sheltered places.

India : Bombay : Malabar Hills in various places ; Back Bay ; Colaba.

Distr. Atlantic Ocean, Mediterranean Sea, Cape, Malayan Archipelago.

Echinocaulon acerosum (Forssk.) Boergs. in Dansk Bot. Arkiv, viii. no. 2, 5 (1932).—*Fucus acerosus* Forssk. Fl. Egypt.-Arabica, 190. *Gelidiopsis rigida* (Vahl) Web. v. Bosse in Rec. Trav. bot. Néerl. i. 104 ; Boergesen, Mar. Alg. D.W.I. ii. 370, fig. 362.—*Fucus rigidus* Vahl in Skrivter af Naturh.-Selsk. v. 46 (1802). *Echinocaulon rigidum* Kütz. Tab. Phycol. xviii. t. 40 ; J. Feldmann, Remarques sur les genres *Gelidium* Lamour., *Gelidiopsis* Schmitz et *Echinocaulon* (Kütz.) emend. in Rec. de Trav. Crypt. dédiés à Louis Mangin (1931).

Gathered once only, and sterile. It agreed very well with my figures (l.c.) ; the young parts of the thallus were densely covered with hairs, as in my figure 362a. Found in a rock pool near low water mark in an exposed locality.

India : Dwarka.

Distr. Seems to occur in all warm seas.

Rhizophyllidaceae.

Catenella repens (*Lightf.*) *Batters*, A Catalogue of British Mar. Algae, 69 (1902).—*Fucus repens* Lightf. Fl. Scot. ii. 961 (1777). *Catenella Opuntia* (Good. et Woodw.) Grev. Alg. Brit. 166 (1830). *Fucus Opuntia* Good. et Woodw. in Linn. Soc. Trans. iii. 219 (1797).

Together with several other small creeping algae this plant forms dense low tufts upon the rocks in the littoral zone.† It grows in exposed localities and as the water is rather polluted much sand and mud is found between the algal vegetation. The specimens, gathered in January, are tetrasporic.

India : Bombay, Malabar Hill facing the Arabian Sea.

Distr. All warmer seas.

*Compare Boergesen, Marine Algae from the Canary Islands, iii. Rhodophyceae, 1, 80 (1927).

†In contrast to the West Indian form (var. *pinnata*) in which the branches issue from the sides of the joints, these structures are given out from the narrowings between the joints. Furthermore the haptera in the Indian plant are often terminal upon long, almost cylindrical or clavate joints.

Chondrococcus Hornemanni (*Mert.*) *Schmitz* in Engl. Bot. Jahrb. xxi. 170 (1895); E. S. Barton, in Journ. Bot. 1896, 460.—*Fucus Hornemanni* Mert. in Göttinger Gel. Anzeiger, no. 64 (1815). *Desmia Hornemanni* Lyngb. Hydrophytolog. Danic. 35, t. 7 C (1819). For more literature see De Toni, Syll. iv. 1674.

I have been able to compare the Indian specimens with the original specimen determined by Mertens, originating from Herb. Hornemann and now to be found in the Botanical Museum, Copenhagen. This specimen was most probably collected by Forsskål in the Red Sea, but by a mistake (perhaps by confusion of labels) it is said to have been found at Elsinore in Öresund. On account of this Lyngbye figures this species in Hydrophyt. Dan. Schmitz, and later Rosenvinge (in Mar. Algae of Denmark, pt. 4, Rhodophyceae, iv. 617 : 1931), have pointed out that this species certainly does not belong to the Danish flora. Whilst I quite agree with these two authors as to this, I cannot agree with them, when they consider *Chondrococcus Lambertii* (Suhr) as a species distinct from *C. Hornemanni*. I concur with Mrs. Ethel S. Gepp (Barton), when she (l.c.) points out very emphatically that these two " species " are one and the same plant. Mrs. Gepp writes : " In the British Museum there are forms of this plant ranging from the very narrow thallus corresponding with Lyngbye's plate of *D. Hornemanni* through all grades up to a large form of *S. Lambertii*. A careful examination of these plants leads to the inevitable conclusion that no form is worthy even of being ranked as a variety, for no one could tell where the typical plant ends and the variety begins." The same is the case with a series of specimens in the Kew Herbarium. These show an even transition from a plant with a thallus about ½ cm. broad to forms with a thallus narrower even than that pictured in " Hydrophytologia." The specimens which I have seen were sterile.

India : Karachi, Island of Hallani *W. J. S. Pullen* (Herb. Kew.). Pamban, *M. O. P. Iyengar* (Herb. Brit. Mus.). It has earlier been found in India by *Wight*.

Distr. Seems to be widely spread in the Indian Ocean.

Gigartinaceae.

Ahnfeltia plicata (*Huds.*) *Fr.* Fl. Scand. 310; J. Agardh, Spec. Alg. ii. 311.—*Fucus plicatus* Huds. Fl. Angl. 470.

There are several sterile specimens in the Kew Herbarium. The breadth of the thallus is 0·5 mm.

India : Karachi, June 1883, *J. A. Murray*.

Distr. North Atlantic Ocean, Brazil, California, Kerguelen Land.

Champiaceae.

Champia compressa *Harv.* var. **scindica,** var. nov. (*Champia scindica Harv.* nomen nudum in Herb. Kew.); a var. *typica* praecipue differt thallo majore et robustiore, plus minus opposite ramoso, ramificatione multo profusiore et densiore.

Of this variety I have had fine fruiting material preserved in spirit and presented to me by Mr. K. G. Naik, Sind College, Karachi. The specimens (Fig. 3) form dense, much ramified bushes about 10 cm. high. The branches are more or less opposite in the lower part and more irregularly arranged in the upper. They issue from the edges of the compressed thallus which reaches a breadth of about 3 mm.; the joints are short. From Harvey's figure in Nereis Australis, t. 30, and from a specimen of his Ceylon Algae, no. 16, preserved in the Botanical Museum, Copenhagen, the Indian plant differs by its greater size, its much denser ramification, and its fewer opposite branches. Transverse sections (Fig. 4b) of the compressed thallus show that its wall consists of a layer of oblong, often rather narrow and densely placed cells, and, near the peripheral ends of these, small scattered cortical cells. The vertical filaments run along the inner side of the cells in the wall, but several are also found in the cavity. The tetrasporangia are scattered in great numbers in the wall. The cystocarps (Fig. 4a) are urn-shaped, up to 900μ broad and a little longer. They are scattered and up to 5–7 may be found upon the same joint (Fig. 3).

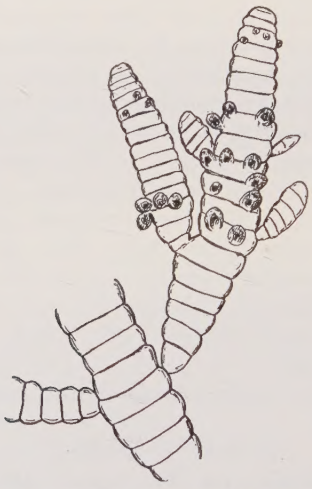


Fig. 3. *Champia compressa* Harv. var. *scindica* (Harv.) Boergs.: part of a female plant (× 4·5).

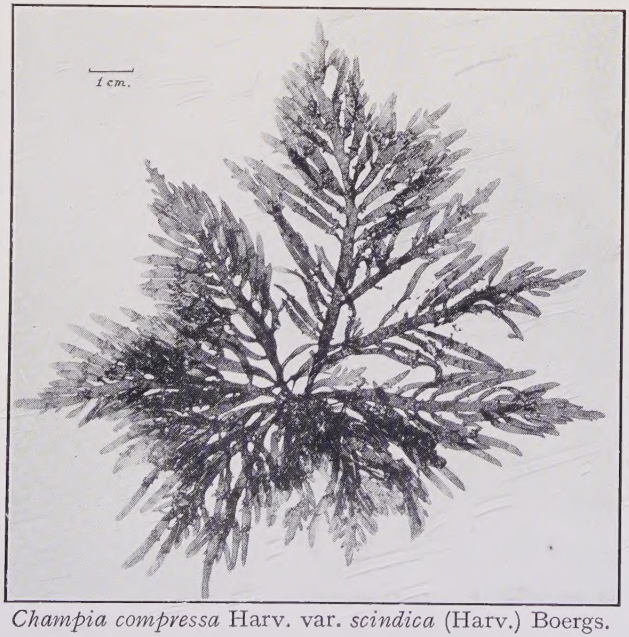
In the Kew Herbarium several specimens named *Champia scindica* are present; a photo of a fruiting specimen of one of these is seen in Plate V. Two other fruiting female specimens are labelled *Lomentaria Opuntia* J. Ag., but they are both most certainly referable to *C. compressa* var. *scindica*.

India: Karachi, December 1859, *W. J. S. Pullen* (type in Kew Herb.); 1881–2, *J. A. Murray*; 1927, Manora Islands & Cape Monze, *K. G. Naik*; *A. B. Kotwal* (Herb. New York Bot. Garden).

Distr. (var. *typica*) Cape, Ceylon, Indian Ocean.

PLATE V

Sarcodia dichotoma Boergs.



Champia compressa Harv. var. *scindica* (Harv.) Boergs.

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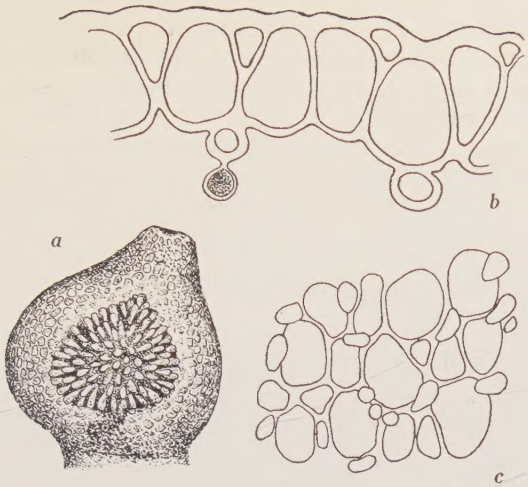

Fig. 4. *Champia compressa* Harv. var. *scindica* (Harv.) Boergs.: a, cystocarp; b, transverse section of the cells in the wall and longitudinal filaments, one of these with a gland cell; c, part of the thallus seen from above showing the cells in the wall and above these the scattered small cortical cells (a, × 34; b, c, × 248).

Champia somalensis *Hauck* in Hedwigia, 1888, 88; Notarisia, iii. 520.—*Champia compressa* f. *somalensis* (Hauck) De Toni in Mem. d. Pontificia Acad. dei Nuovi Lincei, xvii. 15 (not seen).

The thallus forms pyramidal tufts fastened to the substratum by rhizoids. As described by Hauck the wall in this plant consists of a cortical layer of small, densely placed, coloured cells and next to these 3–4 layers of bigger cells, the largest innermost (Fig. 6). Along the walls of these the vertical filaments are to be found, and in addition, several filaments run freely in the cavities of the joints. Like those running along the wall, these filaments pass through the diaphragms and are composed of long, cylindrical cells about 20μ broad and 450μ long. As usual in *Champia*, the vertical filaments bear the gland cells.

In dried material the thallus seems very slightly or not at all constricted, which agrees with the description given by Hauck, whereas in material preserved in spirit the articulation is strongly marked (comp. fig. 5). The joints are about $\frac{1}{2}$–$\frac{1}{3}$ as long as broad. The thallus is subterete and the branches are as a rule placed in two rows on both sides of it; they are irregularly alternate or opposite. The cystocarps (Fig. 5) occur scattered over the thallus; they are urn-shaped, about 800–900μ long, and about that width near their base.

At first the tetrasporangia are formed near the base of the ramuli, but gradually they are developed over the whole thallus. When dried the older parts of the thallus have a dark brown-red colour, whereas the young parts are rosy-red. By reason of the thick

cuticula and wall (Fig. 6) the plant is rather tough and cartilaginous. Specimens with tetraspores and cystocarps are found in January.

I should add that I have not seen the type specimens of Hauck's plant, but my specimens agree very well with Hauck's description. De Toni referred to it as a form of *Champia compressa*. As regards its external habit and general appearance *C. somalensis* is very similar to *C. compressa* var. *scindica*, but it differs in colour and in its thick walls.

INDIA. Dwarka.

Distr. Shores of Somali.

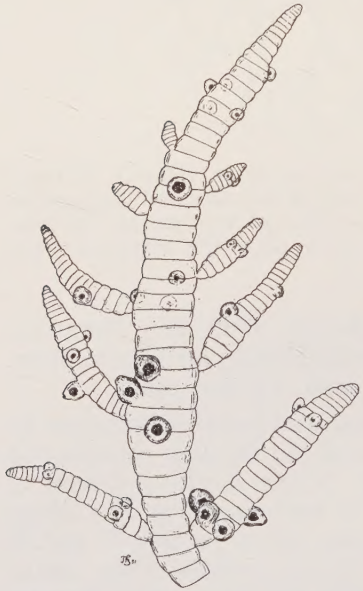

Fig. 5. *Champia somalensis* Hauck: part of a female plant (× 3).

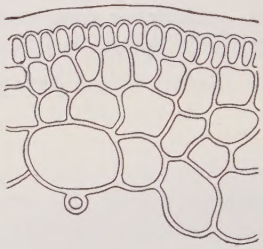

Fig. 6. *Champia somalensis* Hauck: transverse section of thallus and of a single longitudinal filament (× 195).

Champia indica *Boergs.* sp. nov.; *Champiae affini* (Hook. et Harv.) J. Ag. proxima, habitu et colore thalli persimilis, sed species nostra thallo minori, cystocarpiis depressis subsphaericis et ramulis superioribus non incurvatis praecipue differt.

The Indian plant (Plate VI) appears to be related to the Tasmanian with the exception of the differences mentioned above. In Herb. J. Agardh, at Lund, I have been able to compare my plant with the many specimens found there. Some of these differ in habit from my specimens in the presence of numerous tendrils or by peculiar ramification (see Kylin's figure in Lunds Universitets Årsskrift. N.F. Avd. 2, xxvii. no. 11, t. 15, fig. 35). Others, however, agreed with my specimens (*e.g.* no. 26,049 in Agardh's Herbarium). I consider the cystocarps sufficiently different in shape to mark it as a distinct

PLATE VI

Champia indica Boergs. A female (left) and a tetrasporic plant (right).

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species. The geographical distribution is not so important, as several of the Australian species have been found in the northern part of the Arabian Sea.

The specimens reach a height of about 15 cm. and form dense pyramidal tufts; the dried specimens are rosy red. The plant is markedly articulated with barrel-shaped joints (Fig. 7), in the main branches about 3 mm. broad and about as long, in the branchlets only half as long. The wall is composed of one layer only of roundish-polygonal cells about 50–75μ long and 50–60μ broad. Similar small cortical cells to those described by me in *Champia salicornoides* Harv.* were also present here; their diameter is only about 12μ long. The diaphragms are composed of one layer of polygonal cells. The breadth of the vertical filaments varies from 4 to 23μ; they run in the interior of the joints, and are ramified, sending out branches in all directions, some of them approaching the cells of the wall and

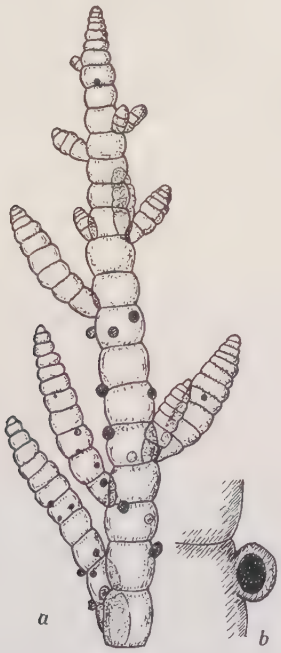


Fig. 7. *Champia indica* Boergs.: a, part of a female plant; b, cystocarp (a, × 4·5; b, × 26).

running along these. Here and there spherical gland cells are present. The tetraspores occur scattered over the surface of the thallus. The cystocarps (Fig. 7b) are relatively small, depressed-subspherical, and about 500μ high and 600μ broad.

India: Dwarka, dredged at a depth of about 8 metres; Okha Port, cast ashore, *Boergesen* 5530 (type); Karachi, December 1859,

*Boergesen, Mar. Alg. D.W.I. ii. 410, fig. 394 E.

W. J. Pullen (Herb. Kew.) ; *A. B. Kotwall* (Herb. New York Bot. Garden).

Champia parvula (*Ag.*) *Harv.* Nereis Bor. Am. ii. 76.—*Chondria parvula* Ag. Syst. Alg. 207.

Found a few times in the littoral region in exposed and rather sheltered localities. Most of the specimens are sterile ; specimens with antheridia were found at the end of February and tetrasporangia in January.

India : Okha Port (cast ashore) ; Tuticorin ; Hare Island.

Distr. Seems to occur in most warm seas.

Sphaerococcaceae.

Sarcodia dichotoma *Boergs.* sp. nov. ; *Sarcodiae marginatae* J. Ag. proxima sed thallo magis gelatinoso, regulariter dichotomo, summis ramorum acutioribus et prolificationibus numerosis saepe praesentibus distincta.

Thallus planus, circiter 20 cm. altus, flabellatim dichotome ramosus circiter 0·5–0·75 cm. latus, e margine frondis prolificationes saepe numerosas gerens. Planta obscurius brunneo-purpurea, carnoso-gelatinosa, exsiccatione chartae bene adhaerent.

India : Karachi, *J. A. Murray* (type in Kew Herb.). Manora near Karachi, Miss *L. Here* (Kew Herb.) ; *A. B. Kotwal* (Herb. New York Bot. Garden).

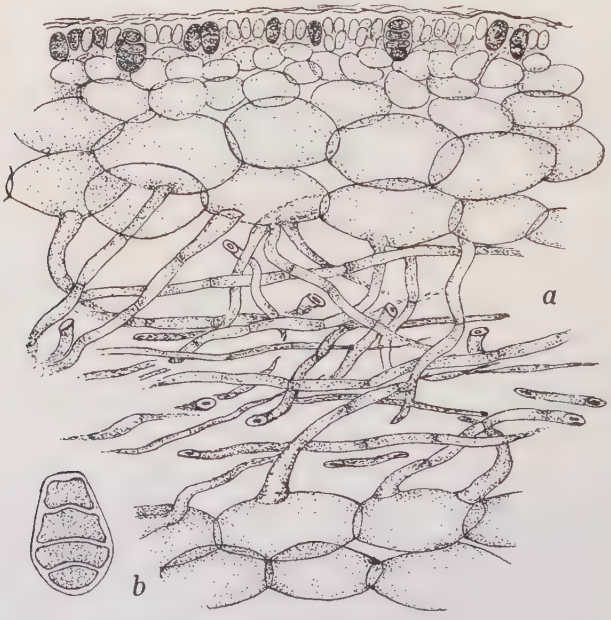


Fig. 8. *Sarcodia dichotoma* Boergs. : a, transverse section of tetrasporic thallus ; b, a tetrasporangium (a, × 110 ; b, × 400).

In the Kew Herbarium three specimens are present; two of these are richly provided with proliferations along the margin of the thallus, one of which (the type specimen) is figured on Plate V; the third specimen is almost destitute of proliferations. A most proliferous specimen is also found in the collection of the New York Botanical Garden. All the specimens are tetrasporic, the zonately divided tetrasporangia (Fig. 8) are developed in the cortical layer. The thallus increases by the fountain type method. A transverse section (Fig. 8a) shows at the periphery a cortical layer of small oblong cells which passes over into a parenchymatic tissue of roundish cells, the bigger ones found innermost; in the middle numerous filaments are woven together.

As mentioned above the plant is nearly related to *S. marginata* J. Ag. and also to *S. ceylanica*; but it is easily distinguished from these by the characters mentioned above and by the fact that only the Indian plant adheres strongly to the paper.

Plocamiaceae.

Plocamium coccineum (*Huds.*) *Lyngb.* Tentam. Hydrophytologiae Dan. 39, t. 9 B (1819). For literature see Rosenvinge, Mar. Alg. Denm. 599. *Fucus coccineus* Hudson, Flora Anglica, ii. 586 (1778).

Two specimens are present in the collection of the Kew Herbarium; one of them, collected in October 1880, has cystocarps.

India: Karachi, 1880 and Manora near Karachi, 1881, *J. A. Murray* (Kew Herb.).

Distr. North Atlantic southwards to the Canary Islands, Mediterranean Sea, South Africa (?), New Zealand (?), Tasmania (?).

Plocamium Telfairiae *Harv.* in Kützing, Spec. 885 (1849); J. Agardh, Spec. ii. 400; Yendo, Bot. Mag. Tokyo, xxix. 111 (1915), where literature is quoted.—*Thamnophora Telfairiae* Harv. in Hooker Journ. Bot. i. 147, t. 125.

It is characteristic of this species that each sympodium carries only two branches, of which the uppermost continues in the same direction as the main stem. In this way we get alternately on each side of the main stem, the spinelike branchlet (i.e. the summit of the shoot pushed aside) and one ramified branch, whereas in *Plocamium coccineum* the rule is two ramified branchlets (*cf.* Oltmann, Morphologie, 598: 1907). I have seen two specimens of this species, one of which consists of several small young plants with broader thallus, while the other is a rather big specimen about 12 cm. high and is tetrasporic. A remarkable feature of this specimen is the fact that it is more or less covered with small proliferations growing out nearly everywhere from the tips of the branchlets. Most probably these proliferations serve as organs of vegetative propagation.

India: Karachi, *A. B. Kotwall.*

Distr. Mauritius, New Zealand, Tasmania, New Holland, Japan.

Gracilaria foliifera (*Forssk.*) *Boergs.* in Dansk. Bot. Arkiv. viii. no. 2, p. 7, fig. 1 (1932).—*Fucus foliifer* Forsskål, Fl. Ægypt.-Arabica, 191. *Fucus lacinulatus* Vahl, Skrivter af Naturh. Selskabet, v. (1802). *Gracilaria lacinulata* (Vahl) Howe in Britton and Millspaugh, The Bahama Flora, 562; Boergesen, Mar. Alg. Dan. West Indies, ii. 379. *Fucus aeruginosus* Turner, Fuci, 147. *Gracilaria multipartita* (Clem.) J. Ag. Alg. Mediterran. 151.

As I have pointed out in the above cited paper Forsskål's name of this plant must be adopted. In the Botanical Museum at Copenhagen we have a very good specimen of Forsskål's from the Red Sea, which much resembles Turner's figure cited above.

In my collection of Indian algae I have found only a few specimens which can be referred to this species. One of these is a female plant, with a thin thallus and rather broad and irregularly divided segments; the other specimens have narrower segments.

India: Ohka Port (cast ashore). Bombay: Colaba (leg. *S. C. Dixit*).

Distr. Warmer Atlantic coasts of Europe and America, Mediterranean Sea, Red Sea, Indian Ocean, etc.

Gracilaria corticata *J. Ag.* Spec. Alg. ii. 602; Epicrisis, 423; Zanardini, Plant. Mar. Rubr. no. 80, p. 57, pro parte.—*Rhodomenia corticata* J. Ag. in Linnaea, xv. 14.

As pointed out by J. Agardh this species, although very closely related to the preceding, nevertheless differs in its more regularly dichotomous and fastigiate thallus which is of a more firm and cartilaginous consistency. The plant grows in tufts reaching a height of about 20 cm. The colour is dark violet red, and the specimens are rigid and cartilaginous with the exception of the upper, younger parts of the thallus which are less rigid and adhere somewhat to the paper. The thallus is more or less regularly di-tripartite, the segments are narrow, 1–2 mm. broad, under the furcations 3–4 mm. The apices of the segments are acute. Proliferations given out from the edges of the thallus are found now and then.

In the Kew Herbarium several specimens of a smaller and more robust form are present; they are about 6–7 cm. high, and the segments up to about 4 mm. broad.

The plant grows in the lower part of the littoral zone in exposed localities in dense tufts fixed to rocks and stones.

INDIA: Karachi, *J. A. Murray* (Kew Herb.); Manora, Miss *L. Here* (Kew Herb.); Dwarka; Carvar; Bengi Bay.

var. **ramalinoides** *J. Ag.*, Spec. Alg. ii. pt. i, p. 602; Epicrisis, 424.

Specimens of this variety form dark red tufts up to about 20 cm. high. The thallus is very much and irregularly divided, the branches becoming shorter upwards like short spines. The thallus is

compressed. At the periphery there are one or two layers of small cells and within the cells gradually become larger.

The Indian specimens show much likeness to the figure of *Fucus lichenoides* Esp. which J. Agardh, l.c., quotes as belonging to this variety. The Indian specimens agree very well with Kützing's figure of *Gracilaria spinescens* (Tab. Phycol. xviii. t. 79) but the thallus of this species is terete.

The plant is common along the shores near Bombay and environs where its tufts are intermingled with those of *Sarconema furcellatum*. Female plants are found in the month of January.

India : Bombay, Malabar Hill, Colaba, Back Bay, Bandra.

Distr. Indian Ocean, Red Sea.

Ceramiaceae.

Callithamnion byssoides *Arn.* in Hooker, Brit. Flora, ii. pt. i, 342 (1833) ; Harvey, Manual, 178 (1849) ; Boergesen in Bot. Tidsskr. xxx. 11 (1909) ; Mar. Alg. D.W.I. ii. 218–220, figs. 205–207.

Referring to my papers quoted above where the literature is mentioned I merely point out that the Indian specimens seem to agree quite with the West Indian plant. The main stems are about 150μ thick, the cells of these are thickest near the crosswall and have very thick walls ; upwards the filaments taper gradually, being in the tips of the filaments 4–5μ only. In many of the apices of the filaments thin short hairs are present ; compare Rosenvinge's figure 266 (Mar. Alg. Denmark, pt. 3, p. 340) where the plant is called *Callithamnion Furcellariae*. Female and antheridial plants occur. It was found epiphytically upon *Neurymenia fraxinifolia*.

India : Tuticorin.

Distr. North Atlantic Ocean, Canary Islands, Mediterranean Sea, West Indies, Guadelupe Island in the Pacific.

Spyridia alternans *Boergs.* sp. nov. ; *Spyridiae complanatae* proxima, quae tamen ramificatione diversa et magis evoluta, habitu plumoso, inter alia a specie nostra distincta est.

Thallus caespitosus, irregulariter ramosus, circiter 25 cm. altus et ultra, articulatus et corticatus, in inferiori parte circiter 1½ mm. latus ad apicem gradatim attenuatus, compressus, ramis, et (in superiore parte ramorum) ramulis distiche instructis. *Ramuli* singuli ex omni articulo ramorum orti, alternantes, breves, ex articulis 8 compositi, ad genicula corticati, circiter 250–300μ longi, in parte basali 50μ lati, in summis circiter 20μ lati, aculeis 2–4 recurvatis armati.

India : Karachi, *J. A. Murray* June 1884 (Kew Herb.) ; *A. B. Kotwal* (Herb. New York Bot. Garden) ; Manora near Karachi, Miss *L. Here* (Kew Herb.).

Of this species I have seen only two well prepared specimens, a small one found in the Kew Herbarium and a larger specimen (Plate VII) found in a collection of Indian Algae which Dr. M. A. Howe, New York Botanical Garden, sent me for determination. I have also seen a few specimens, most probably cast ashore,

destitute of ramuli, belonging to the Kew Herbarium. It is a most irregularly branched plant of a rather dark red colour reaching a height of about 25 cm. The plant (Fig. 9) is markedly distichous : branches as well as ramuli issuing from the edges of the thallus which to judge from dried material is very much compressed. The main branches are about 1·5 mm. thick near the base, tapering slowly upwards. The ramuli are shed early, being found only in the upper ends of the branches. The main branches become corticated rather quickly. In the ramuli the cortical layer forms annular coverings above the cross walls. As a rule the short ramuli are composed of 8 big cells, and ended in 2–4 curved spines. The ramuli are placed alternately on each side of the branches one upon each segment (Fig. 9). The specimens I have seen were sterile.

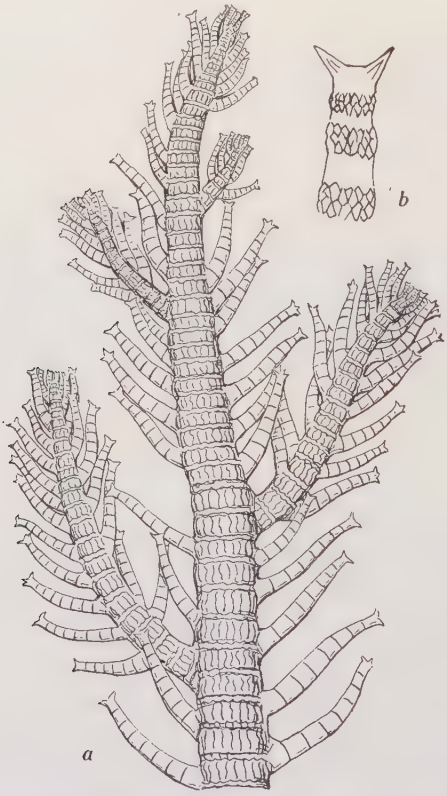
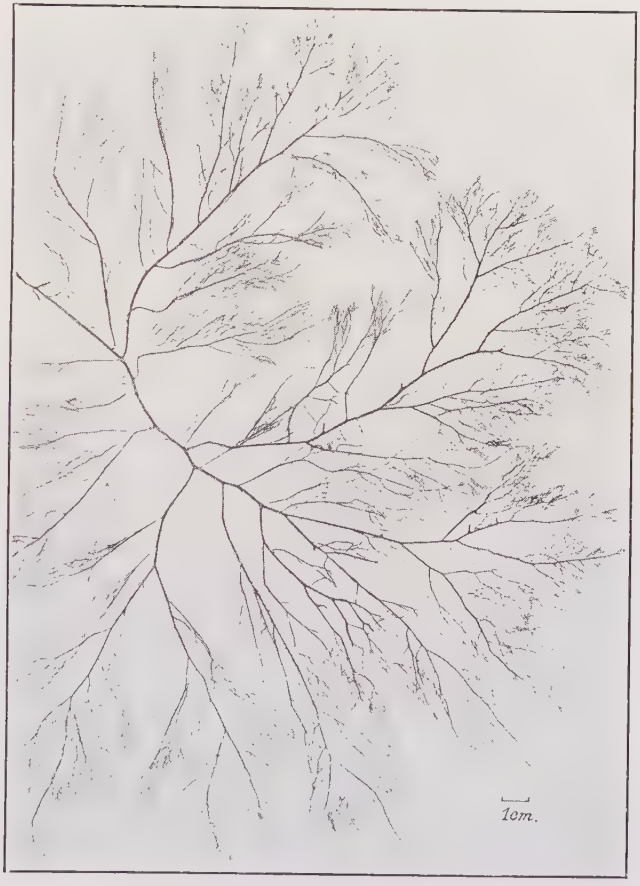


Fig. 9. *Spyridia alternans* Boergs. : a, part of thallus; b, upper end of ramulus (a, × 34; b, × 188).

Spyridia insignis J. Ag. Spec. Alg. ii. 344 ; Epicr. 272.—*Spyridia ericoides* Kütz. Spec. Alg. 668 ; Tab. Phycol. xii. t. 52.

A tetrasporic specimen is present in a collection of Indian algae most kindly sent to me for determination by the Director of the British Museum (Nat. Hist.) London.

PLATE VII



Spyridia alternans Boergs.

[*To face page* 126.

India : Cape Comarin, *Parthasarathy Iyengar*, Sept. 1920. This species had been collected previously by *Wight* near Madras.

Distr. India, Cape.

Delesseriaceae.

Caloglossa Leprieurii (*Mont.*) *J. Ag.* Epicr. 499.—*Delesseria Leprieurii* Mont. in Ann. Sc. Nat. Bot. sér. 2, xxiii. 196, t.v. fig. 1.

Well developed tetrasporic specimens are found in the littoral zone on exposed coast in January.

Together with the following species and other small creeping algae it forms on the rocks extensive low cushions in which much sand and mud are accumulated.

India : Bombay, Malabar Hill facing the Arabian Sea.

Distr. Widely distributed in warmer seas.

Caloglossa bombayensis *Boergs.* sp. nov. ; *Caloglossa zanzibariensi* Goebel* proxima sed haec species (a nostra) thallo latiore,

Fig. 10. *Caloglossa bombayensis* Boergs. : part of a plant (× 22·5).

*In Flora, lxxxv. 65 (1898).

seriebus cellularum in utroque latere costae magis evolutis, apicibus thalli magis curvatis imprimis diversa est.

Frons repens, caespites densas formans, subdichotome ramosa, irregulariter nodoso-articulata, in latere nodorum prolificationes plus minus numerosas et deorsum rhizoideas emittens. *Thallus* costatus, angustus, ad 200 μ latus et 70 μ crassus, e segmentis ab utraque parte attenuatis compositus. *Segmenta* e costa media et utrobique lamina monostromatica angustissima composita.

India: Bombay, Malabar Hill on exposed rocks in the littoral zone, *Boergesen* 5208$\frac{1}{6}$(type).

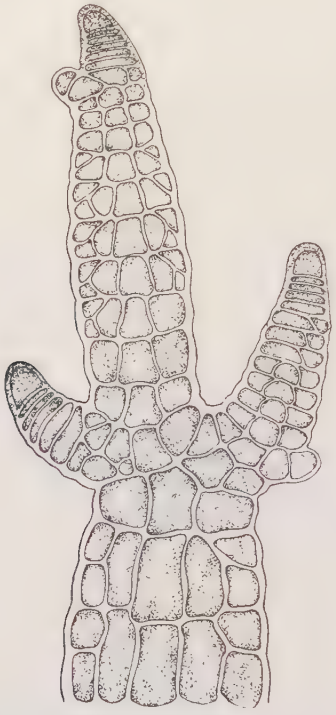


Fig. 11. *Caloglossa bombayensis* Boergs.: apex of thallus showing development of branches (× 375).

This elegant small plant (Fig. 10) forms dense, low, mosslike tufts upon the rocks to which it is fixed by means of numerous strong rhizoids given out from the nodes. The ramification is rather irregular, as the joints are of different lengths. The thallus is not much narrowed at the nodes. At the apex the thallus is at first cylindrical but transverse sections (Fig. 12) show that it soon becomes oblong and at last, when the marginal cells are formed, lengthened-elliptical. From the nodes the branches are given off. These are not really opposite but as in *Caloglossa amboinense* Karsten* they

*In Bot. Zeit. xlix. 265, t. 5 (1891).

issue opposite to each side, one from each of two neighbouring segments (Fig. 11). Later on several adventitious shoots are given out and these are in most cases developed near the base of the preceding ones on the outer side of them (Fig. 10). By this type of ramification a short, thick, sympodially built up, somewhat curved branch-system is formed giving the older nodes a very characteristic appearance. The development of the thallus is performed very similarly to that of *Caloglossa amboinensis*. The thallus grows by means of a large apical cell from which segments are successively cut off (Fig. 11). When the segments have reached some size they are divided successively in a central and 4 pericentral cells of which the two on both sides of the central one are the biggest and first formed (Fig. 12a), while the other two are smaller and lie above and below the central cell. All together these cells form the midrib of the thallus and are all of the same length. Then the upper and lower corners of the large pericentral cells are cut off and these cells are again divided a few times forming the flanks on both sides of the midrib (Fig. 11). As a rule three rows of cells are formed on both sides of the midrib, in rare cases four (Fig. 10).

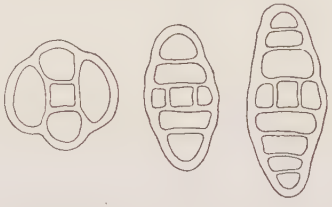


Fig. 12. *Caloglossa bombayensis* Boergs.: transverse section of thallus (× 165).

As is mentioned above this small *Caloglossa* is very nearly related to *C. zanzibariensis* Goebel. I am able to state this definitely as I have examined an original specimen, and I wish to thank Professor Dr. K. Goebel and Dr. v. Schwenau, Keeper of the Bayerisches Staats-herbarium, most warmly for allowing me to see this specimen. The examination showed that the adult thallus, which as stated by Goebel reaches a breadth of 250–400 μ, consists on both sides of the midrib of a lamina composed of 8 rows of cells and thus as a rule more than double that found in the Indian plant and as the cells in the African plant are moreover somewhat bigger than those found in the Indian plant, the thallus naturally becomes much broader. The apex of the Indian plant is curved somewhat downwards but not so much as is the case in the other species as figured by Goebel. I may add that of the species of *Caloglossa* hitherto known, the African plant comes nearest to *C. Ogasawaraensis* Okamura (in Bot. Mag. Tokyo, xi, 12 : 1897) but this plant is much broader (2–3 mm.) and the segments are much narrowed at the nodes, thus becoming ellipsoid in shape.

Membranoptera Murrayi *Boergs.* sp. nov.; *Membranopterae alatae* proxima, sed thallo angustiore et tenuiore, venis lateralibus microscopicis imprimis distincta.

Planta ad 12 cm. alta et ultra (?), subdichotome ramosa, costata, colore roseo-rubra. *Segmenta* linearia, 1½–2 mm. lata, ala angustiore et venis microscopicis instructa. *Cystocarpia* et *antheridia* ignota. *Tetrasporangia* in utroque latere costae segmentorum terminalium exstant. *Substantia* tenuis, ita ut specimina exsiccata chartae arcte adhaereant.

India: Karachi, June 1883, *J. A. Murray* (Type [Plate VIII] in Kew Herb.). Sind coast, *Y. V. Paul*, 22/4/1927 (Kew Herb.).

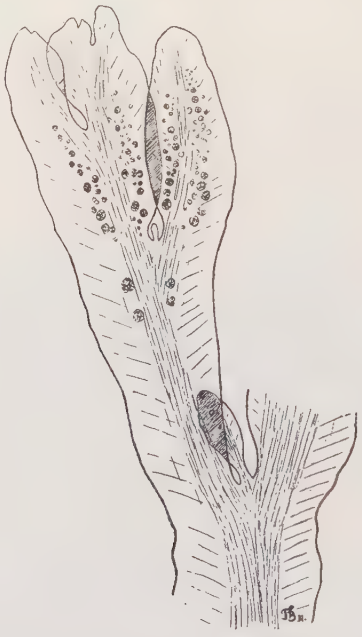


Fig. 13. *Membranoptera Murrayi* Boergs.: part of thallus with tetrasporangia (× 13·5).

The structure of the Indian plant (Fig. 14) seems to agree with that of *Membranoptera alata* according to the published descriptions especially those of Wille,* Kylin,† and Rosenvinge.‡ According to Kylin the structure of the thallus in *M. alata* is very like that in *Delesseria sanguinea*, but it differs in the absence of intercalary divisions, in the lateral pericentral cells not being transversely divided, and finally in the branching of the thallus taking place

*Wille, N. in K. Svenska Vet.-Akad. Handl. xxi. Stockholm (1885), and in Nova Acta Leop.-Carol. deutsch. Akad. lii., Halle (1887).

†Kylin, H. in K. Svenska Vetenskapsakad. Handl. lxiii. Stockh. 108 (1923).

‡Rosenvinge, L. K. Mar. Alg. Denm. pt. 3, p. 481.

PLATE VIII

Membranoptera Murrayi Boergs.

[*To face page* 130.

through the transformation of secondary apical cells into primary ones. These features also occur in the Indian plant, and its whole habit is very like that of *M. alata*. But some differences appear to be present. (I have seen only three dried specimens and therefore I do not know its possible variation.) Thus the thallus in the Indian plant is slenderer and thinner. It is about $1\frac{1}{2}$–2 mm. broad and retains almost the same breadth from the apical ends downwards until only the midrib is left. On account of its thinner thallus the plant adheres strongly to the paper, whereas *M. alata* usually does not or at most very badly. Further the colour is lighter ; the dried specimens in their upper parts are light rosy-yellow and darker red below, but not the dark almost scarlet colour found in *M. alata*. The veins are much less developed being microscopical whereas in *M. alata* they are easy to see by means of a lens. They are arranged as in *M. alata*, those of second order emerging from the lower side of those of first order (comp. ROSENVINGE, l.c. fig. 446). Adventitious shoots are common in the axils of the branches. The midrib is less developed and not so thick as in *M. alata*.

Fig. 14. *Membranoptera Murrayi* Boergs. : apex of thallus (× 450).

The specimens are tetrasporic. The tetrasporangia are formed in long rather narrow belts on both sides of the midrib in the upper end of the lobes of the thallus (Fig. 13) ; they are also found in the adventitious branchlets but these are less common in the Indian plant. According to ROSENVINGE the tetrasporangia in *M. alata* occur especially in the adventitious branchlets and the sori seem also to be broader and of more irregular shape (comp. KYLIN'S figures, l.c. p. 109, fig. 69, 1923). When to these differences is added the geographical distribution I think it is justifiable to consider the Indian plant a different species. But it is a very interesting fact that a plant so closely related to *M. alata* is found in the Arabian Sea. I have named the Indian plant after its discoverer, who, to judge from the collection of algae which the Director of Kew has placed at my disposal, has gathered many interesting species of algae in the environs of Karachi.

Claudea elegans *Lamx.* in Ann. du Muséum, xx. t. 8, figs. 2–4 (1813); J. Agardh, Spec. Alg. ii. 1275. For synonyms see De Toni, Syll. Alg., iv. 748.

A fine but sterile specimen of this elegant plant occurred in a small collection of algae, which Mr. A. B. Kotwall, Karachi, most kindly has sent me. The hitherto known distribution of this species is the shores of Tasmania and South-West Australia and finally Ambon, where Mme. Weber found a small specimen in a collection of algae made by the Danish expedition to the Kei Islands. Its occurrence so far from its known area is therefore of much interest and forms an important addition to the number of species common to these far-off areas.

India: Coast of Sind: Karachi, *A. B. Kotwall.*

Distrb. Tasmania, S.W. Australia, Ambon.

Rhodomelaceae.

Falkenbergia rufolanosa (*Harv.*) *Schmitz* in Engler u. Prantl, Natürl. Pflanzenfam. i, Abt. 2, p. 479 (1897); Falkenberg, Rhodomel. 690; Yendo in Bot. Mag. Tokyo, xxx. 62 (1916); Kützing, Tab. Phycol. 14, t. 54 f, g.

As mentioned by Yendo (l.c.) *Falkenbergia Hillebrandii* (Bornet) Falkenb. so much resembles *F. rufolanosa* that they probably represent the same species, and the figures of one of the latter* can just as well be used for *F. rufolanosa.* The Indian specimens are about 40μ (rarely a little more) thick in the main stems, decreasing to about half this size in the upper young filaments; thus they have the same breadth as that given by Yendo for his specimens. The segments were often thickest in the middle. The specimens were sterile. Twice and in very different localities I have met with this plant. In one of them it was growing upon dead crusts of Corallines on rocks near high water mark in a very exposed locality during the monsoon. In the other locality it was found in deep sea upon shells of the pearl-mussels taken up by divers.

India: Dwarka, the pearlbank near Tuticorin.

Distr. Australia, Japan, Malay Archipelago, Atlantic Ocean (?).

Chondria tenuissima (*Good.* et *Woodw.*) *Ag.* Spec. Alg. i. 352. For more literature compare De Toni, Syll. Alg. iv. 834.—*Fucus tenuissimus* Good. et Woodw. in Linn. Trans. iii. 215, t. 19.

Two specimens, one of which (gathered in March) is tetrasporic, are present in the Kew Herbarium.

India: Karachi, *J. A. Murray.*

Distr. North Atlantic, Mediterranean Sea, California, Tongataba, Honolulu, etc.

*Compare for instance my figures in Mar. Alg. D.W.I. 332-3 and Kylin's in Bot. Notiser, 1928, 236. Kylin points out that *Falkenbergia Doubletii* Sauvag. is conspecific with *Falkenbergia Hillebrandii,* but J. Feldmann in Contrib. à la Flore algolog. marine de l'Algérie (Bull. Soc. d'Hist. Nat. de l'Afrique du Nord, 246, t. 22: 1931), who does not quote Kylin, pleads for the separation of these two species.

Chondria dasyphylla (*Woodw.*) *Ag.* Compare Indian Rhodophyceae: II, Kew Bulletin, 1932, 113.

Two tetrasporic specimens found in the Kew Herbarium and determined as *Chondriopsis* near *C. Harveyana* are referable to this species.

India: Karachi, *J. A. Murray*, 6/83.

var. **stellata**, var. nov.; a var *typica* var. *stellata* praecipue differt ramulis tetrasporangiiferis in fasciculis praesentibus, ramificatione magis irregulari.

Compared with the typical form the Indian plant (Plate IX) is more irregularly ramified, and the branches are given out on all sides, some being short and some long. Some of the branches are far apart, some quite near together. They may be little or much branched; all are more or less curved.

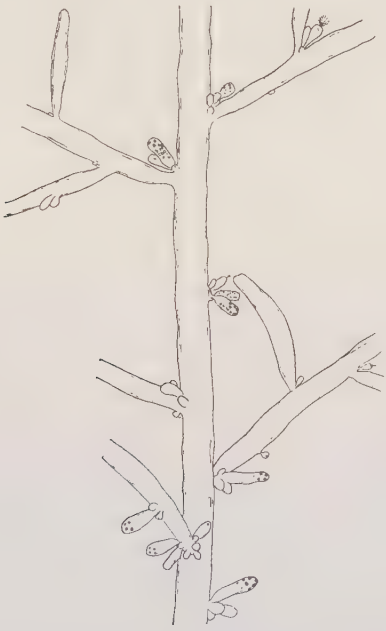


Fig. 15. *Chondria dasyphylla* (Woodw.) Ag. var. *stellata* Boergs.: part of thallus with tetrasporic stellately placed ramuli (× 2·6).

The fascicles of the adventitious, fructiferous ramuli make the plant look still more irregular. The ramuli (Fig. 15) are developed upon the large main filaments as well as upon the minor branches. They are scattered without order upon the filaments either far from the branches or at the base of them.

A transverse section of the thallus (Fig. 16) shows 5 pericentral cells encircled by big cells of about the same size as the pericentral cells, the cells outside these becoming abruptly much smaller. This

variety reminds one somewhat of *Chondria nidifica* Harv. on account of the small stellate fascicles formed by the short fructiferous ramuli ; but the ramification of the Indian plant is very different.

From typical *C. dasyphylla* it differs especially by its more irregular ramification and by the fascicles of fructeriferous ramuli ; in the typical form the ramuli occur as a rule solitarily, but as is pointed out by Hauck (Meeresalgen, 210) in the typical form several ramuli may grow out together especially near the base of the branches.

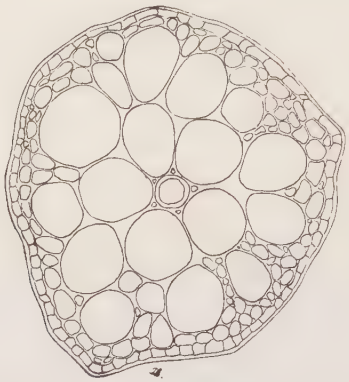


Fig. 16. ***Chondria dasyphylla*** (Woodw.) Ag. var. ***stellata*** Boergs.: transverse section of thallus (× 140).

In the collection of algae from the New York Botanical Garden there is a specimen coming near to this variety having the ramuli sometimes placed in small groups and with more irregular ramification.

India : Dwarka.

Acanthophora Delilei *Lamx.* Essai Thalassioph. 44 ; J. Agardh, Spec. Alg. ii. 817.

This species seems to be common on the coast of India along the Arabian Sea. It grows a little below low water mark in exposed and rather sheltered places. All my specimens were sterile, but specimens from Karachi gathered in December have cystocarps.

India : Karachi, Dec. 1859 *W. J. S. Pullen* (Herb. Kew) ; Okha Port ; Bombay from several localities ; Tuticorin, Hare Island ; Pambam, Oct. 1922, *W. Parthasarathy Iyengar* (Herb. Brit. Mus.).

Distr. Mediterranean Sea, Black Sea, Red Sea, shores of Somali.

Laurencia papillosa (*Forssk.*) *Grev.* Alg. Brit. p. lii (1830) ; J. Agardh, Spec. Alg. ii. 756 ; Kützing, Spec. Alg. 655, and Tab. Phyc. xv. 62 ; Boergesen, Mar. Alg. D.W.I. 246, fig. 236.—*Fucus papillosus* Forssk. Fl. Ægypt.-Arab. 190.

The Indian specimens agree quite well with this species as to shape and appearance, and resemble to a great degree both Kützing's figure above quoted and the original specimen in Forsskål's

Herbarium. The specimens show the palisade-like shape of the peripheral cells, as I have described and figured it (l.c.). Lenticular thickenings are not present.

My specimens were gathered in the lower part of the littoral zone in very exposed localities.

India : Bombay (Malabar Hills facing the Arabian Sea !). Pamban, *Parthasarathy Iyengar* (British Museum).

Distr. Warmer Atlantic Ocean, Mediterranean and Red Seas, Indian Ocean, etc.

Laurencia cruciata *Harv.* in Trans. Irish Acad. xxii. 544, and Phyc. Austr. Syn. no. 311 ; J. Agardh, Epicrisis. 652 ; Yamada, Notes on *Laurencia*, 198, fig. E.

To this species I have referred some specimens which I gathered at Dwarka. The specimens are caespitose, about 13–14 cm. high, of rather cartilaginous consistency, and of dirty yellow brown colour in dried specimens. The thallus is terete, and a transverse section shows that the peripheral cells are palisade-like with thick walls as in Yamada's figure. Lenticular thickenings are not present. I may add that I have compared my specimens with those in J. Agardh's Herbarium in Lund and found that they are very like his examples from Encounter Bay and George Town, Tasmania, having, when dry, the same horny consistency and dark-brown colour.

India : Dwarka.

Distr. West Australia.

Laurencia pannosa *Zan.* Phycearum Indic. Pugillus, 11, t. 6 B, figs, 1–2 (1872) ; Yamada, Notes on *Laurencia*, 199.

The Indian specimens seem to agree quite well with Zanardini's description and figures. The plant forms crustlike cushions in exposed places upon rocks to which are fastened by means of numerous discs the more or less decumbent and interwoven filaments of the thallus, and by means of such discs the filaments are also connected with each other. The thallus is very irregularly ramified on all sides. The thicker filaments are about 350μ thick. A transverse section shows that the peripheral cells are roundish-quadrangular, but when seen from above are roundish-oblong, with a diameter of about 50μ. Lenticular thickenings are present in the medullary tissue.

India : Dwarka.

Distr. Malayan Archipelago.

Laurencia obtusa (*Huds.*) *Lamx.* var **majuscula** *Harv.* Phycol. Austr. Synopt. Cat. no. 309 b ; Yamada, Notes on *Laurencia*, 223.

As mentioned in his valuable monograph, Yamada during his stay in Berkeley, California, saw a specimen of this plant in a collection of algae which one of the young Indian students, whom I met in India, had sent to Professor Setchell. Professor Setchell has most kindly allowed me to see this specimen, and I find it agrees entirely

with mine. The plant forms dense tufts up to about 15 cm. It has a beautiful scarlet-red colour and a rather soft carnose consistency adhering closely to paper. It is abundantly ramified to all sides. The branches and branchlets are clavate. The thallus is terete with a percurrent axis and paniculate outline. A transverse section shows that the peripheral cells are about as long as broad with rounded corners. Lenticular thickenings are not present. The surface cells project very much near the end of the branchlets, as pointed out by Yamada.

India : Dwarka, in rock pools near low water mark.

Distr. Warmer Atlantic, Pacific and Indian Oceans.

Laurencia pedicularioides *Boergs.* sp. nov.; *Laurenciae spectabili* Post. et Rupr. promixa sed differt ramificatione diversa, pinnulis magis evolutis saepe subdivisis, series longas in utroque latere ramorum formantibus, substantia carnosa, colore roseo-rubro.

Frons usque ad 15 cm. alta et ultra, complanata, 3–4 mm. lata et 1 mm. crassa, distiche pinnato-ramosa. *Rami* hic illic irregulariter evoluti. *Pinnae* plerumque circiter 3 mm. longae, interdum ad ½ cm. et ultra, in parte basali angustiores, apicem versus latiores, mox indivisae et late rotundatae, mox in 2–3 lobos divisae. *Tetrasporangia* in superiore parte pinnarum formata, globosa, permagna, circiter 120μ lata. *Substantia* carnosa; specimina exsiccatione chartae arctissime adhaerent. *Cystocarpia* et *antheridia* ignota.

India : Dwarka. *Boergesen* 5449 (type).

This plant (Plate IX) is certainly closely related to the Californian *Laurencia spectabilis* Post. et Rupr. Large forms of *Laurencia pinnatida* (Gmel.) Lamx. also come near to this species, for instance the fine large form found at Clare Island on the West coast of Ireland. But the ramification of the Indian plant is different and the pinnae are not so much developed. As regards the anatomy of the Indian plant the peripheral cells are roundish polygonal. The cells of the medullary layer have rather thick walls, but I have not found any lenticular thickenings. The plant was found near low water-mark and had tetrasporangia in January. Plants with antheridia and cystocarps have not been found. The older parts of the thallus are dark red and more or less densely covered with epiphytes, whereas the younger parts have a fine rosy-red colour.

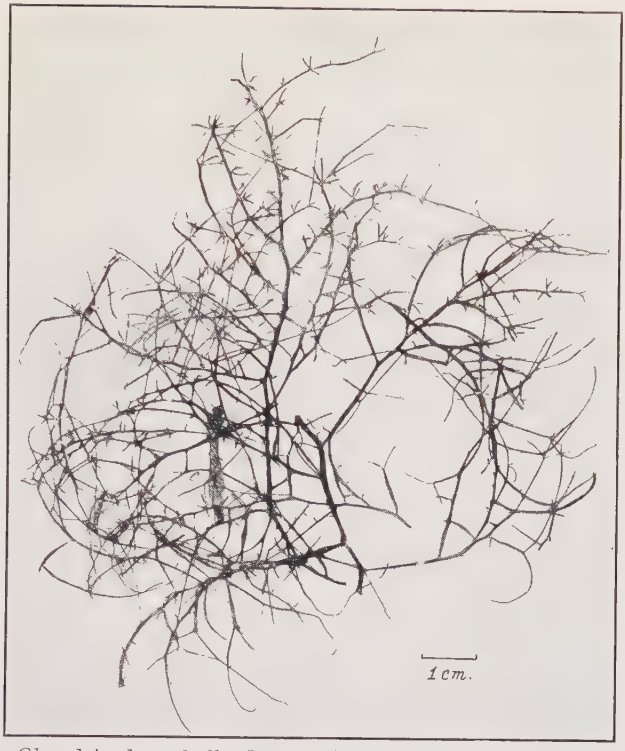
Dictyurus purpurascens *Bory* in Belanger, Voyage, 170, t. 1, fig. 2; J. Agardh, Spec. Alg. ii. 1245. Falkenberg, Rhodomelaceen, 675.

In the somewhat polluted water in the environs of Tuticorin the plant was dredged at a depth of about only 2 fathoms ; Mme.Weber says she found it at a depth of 30 metres. My specimens were sterile. The species is described upon specimens from India (Cap Comorin) collected by Belanger.

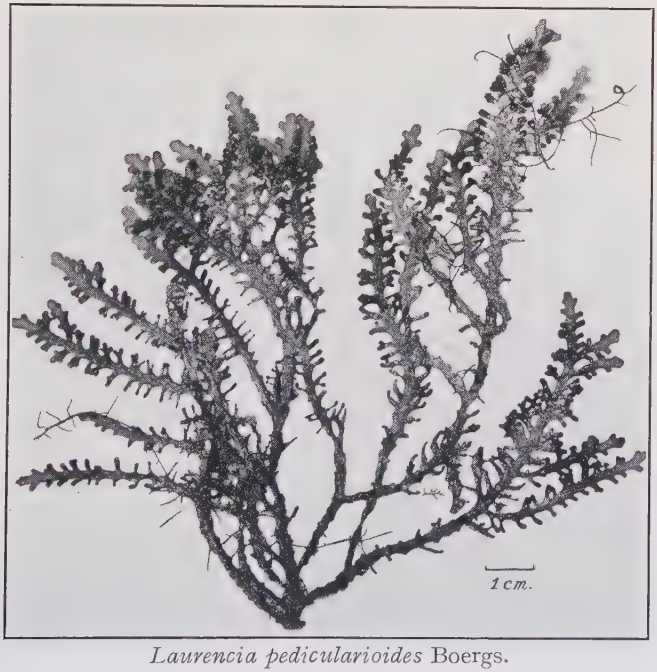
India : Tuticorin ; Cap Comorin, *Belanger* ; without locality, *Wight.*

Distr. Indian Ocean.

PLATE IX



Chondria dasyphylla (Woodw.) Ag. var. *stellata* Boergs.



Laurencia pedicularioides Boergs.

[*To face page* 136.

Neurymenia fraxinifolia (*Mert.*) *J. Ag.* Spec. Alg. ii. 1135; Falkenberg, Rhodomelaceen, 444, t. 7, figs. 20–29; Okamura, Illustrat. Alg. Jap. i. t. xiii (1901).—*Fucus fraxinifolius* Mert. in Turner, Fuci, t. 193. *Epineuron fraxinifolium* Harv. in Hook. Lond. Journ. Bot. iv. 532 (in note); Kützing, Tab. Phycol. xiv. t. 99. *Dictymenia fraxinifolia* J. Ag. in Linnaea, xv. 27; Harvey, Phycol. Australica, t. 124.

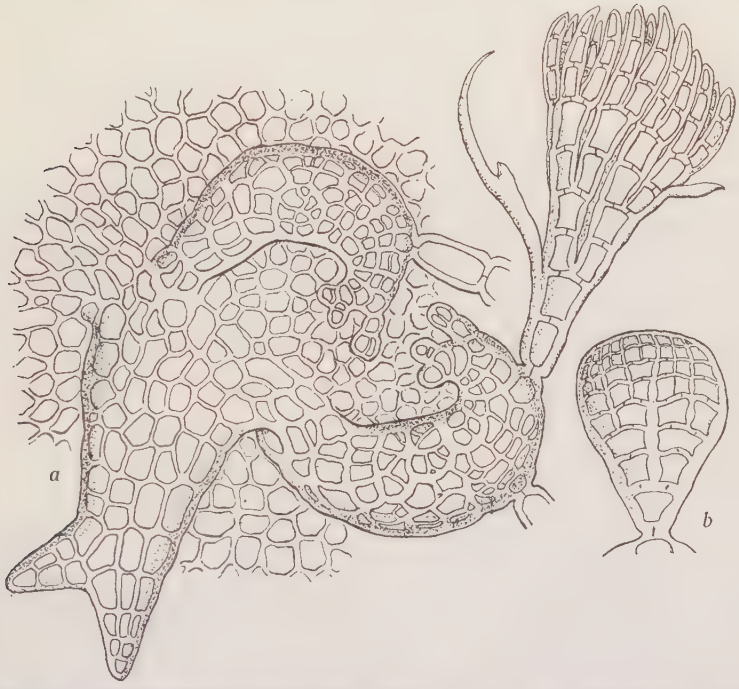


Fig. 17. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, part of the thallus with one adventitious branchlet of first order and two tetrasporic ones of second order with trichoblasts (× 225), b, a young trichoblast still surrounded by the solid cuticula which is burst in the larger trichoblast in figure a (× 300).

As regards the structure and building up of the thallus of this fine plant Falkenberg has given a detailed description. Falkenberg's material, however, was sterile. But Falkenberg was able to point out that the fructiferous organs are to be found in the secundary adventitious branchlets which he therefore designated as the "Fruchtäste," and he based this upon the fact that only in these branches are trichoblasts developed, at the same time referring to Harvey's figure. As described by Falkenberg the fertile branchlets are developed from surface cells round the base of the primary adventitious branchlets (Fig. 17a). The last mentioned have a radial structure, the secondary adventitious branchlets are dorsiventral. From most of the segments on the dorsal side of the fertile branchlets a trichoblast is given off. The figure shows this, as well as the development of the fertile branchlets. When young the

trichoblasts, in accordance with the group *Amansieae*, form a dense, almost pear-shaped body surrounded by a common cuticle (Fig. 17b), and the cells in the trichoblasts remain short until the cuticle bursts during further growth and the trichoblasts grow out normally with long cells (Fig. 17a).

In my material I have found not only stichidia but also cystocarps and one antheridium. The tetrasporangia are formed in the two pericentral cells lying on both sides of the ventral one (see Fig. 18b).

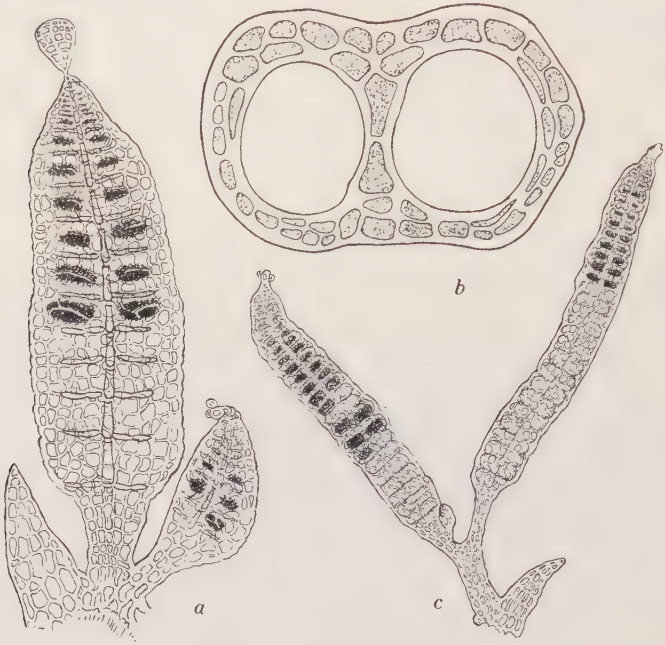


Fig. 18. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, short, broad stichidia with short stipes in a plant from South India (Tuticorin); b, transverse section of stichidium of the same plant; c, long narrow stichidia with long branched stipe in a plant from Australia (a, × 83; b, × 248; c, × 68).

Harvey (l.c.) was the first to describe and figure the stichidia in more detail. It must be said, however, either that Harvey's figure and description were not very good or that the Australian plant differs much from the Indian. Harvey's description is as follows: "Stichidia are abundantly borne on the nerves; they are narrow, linear, mucronate, simple or proliferously compound containing a double row of vertically flattened tetraspores."* But in my plant (comp. Fig. 18a), the shape of the fully developed stichidium is

*As to the compounded stichidia of Harvey's Falkenberg has his doubts. He writes: "Wenn Harvey den Muttersprossen, an dem die Stichidien inserirt sind, nicht erwähnt, so kommt das wohl daher, dass dieser neben den kräftig entwickelten sporenbildenden Fruchtästen so zurücktritt, dass er von Harvey ganz übersehen werden, und Harvey aus dem gleichen Grunde auch direct von 'versweigten Stichidien' sprechen konnte." That the primary adventitious branchlets also are found in the Australian plant is shown by Fig. 18c.

elongated ovate or oblong with more or less rounded apex and a short stalk; the stichidium is somewhat compressed with two tetrasporangia in each segment; compound stichidia were not found. On account of these differences it would be of interest to examine specimens from other localities. The type-specimen of *Fucus fraxinifolius* Mertens, originating from Vahl's Herbarium and preserved in the Botanical Museum at Copenhagen (Turner, Fuci, t. 193), is tetrasporic. It is from "India orientalis," without definite locality. The stichidia in this specimen (comp. Turner's Fig. d) with the exception of some minor differences, are very like those in mine. They have the same shape, though often a little longer, the same breadth, about 220μ, and the rather large tetrasporangia (about 100μ long and 70μ broad). Furthermore the stichidia in the type-specimen have often a rather long stalk, whereas in mine it is quite short, and in the type-specimen I found one stichidium the upper part of the stalk of which bore a branch with a second stichidium.

Although Vahl's specimen showed some resemblance to the figure and description of Harvey's Australian plant, it differed greatly from it in some respects, and therefore I wrote to Kew asking for the loan of Harvey's specimens of *Neurymenia fraxinifolia*, and the Director of Kew kindly sent me the material from Australia and surrounding countries. In fine tetrasporic specimens from Freemantle, W. Australia (coll. W. Harvey and G. Clifton) the stichidia (Fig. 18c) are very long (up to 2½ mm.), slender, about 170μ broad, having almost the same breadth from the base to the apex and containing two long rows of densely placed tetraspores smaller than those in the Indian plant, namely about 85μ broad and 55μ high. In most of the stichidia a rather long, slender stalk is present; the upper end of the stichidia consists of a short, often curved attenuated sterile part with remnants of trichoblasts. Compound stichidia in which, as shown in Harvey's drawing, the fertile parts are branched were not found, but in one stichidium there is a branch given off from the upper end of the stalk (Fig. 18c) and in another there was not only one large branch from the stalk ending in a stichidium, but also 3 poorly developed branchlets. Even, therefore, if stichidia with branched stalks are rarely present, there are no compound stichidia as in Harvey's drawing, and, further, the shape of the stichidia is somewhat different. As regards the form from Nova Caledonia (Kützing, Tab. Phyc. xiv. t. 99, fig. 6) its stichidia resemble those of the Indian plant. And according to Okamura's figures (l.c.) Japanese specimens have rather acute but short and short-stalked stichidia.

The cystocarps were unknown until A. D. Cotton (Kew Bulletin, 1913, 254) referred to them as occurring on the adventitious shoots (whether primary or secondary could not be ascertained) which spring from the surface of the fronds. Later Mme. Dr. Anna Weber (Liste Alg. Siboga, 1923, 374) mentions the cystocarps in a specimen from Ceylon. As to the origin of the cystocarps they are said to be

borne " sur les petites pousses cylindriques (les pousses adventives), qui se développent, soit au bord de la fronde, soit sur les veines latérales." It should be noted that the cystocarps are developed like the stichidia upon the dorsiventrally built adventitious branchlets of second order (comp. Fig. 19a). Although my material of the female plant was dried, I can state that the procarp is developed as with the *Rhodomelaceae* in the second basal cell of the fertile trichoblast. The trichoblasts destined to be fertile remain quite short, having only one undivided segment above the fertile one (Fig. 19b). During the further growth of the procarp this cell is easily seen on the upper side of the procarp. The trichoblasts form in the female fruiting branchlets a row along the dorsal side, one trichoblast as a rule being developed from every other segment, and in accordance with this the procarps also form a row along the dorsal side of the branchlets (Fig. 19) ; generally two to five procarps are formed on the same

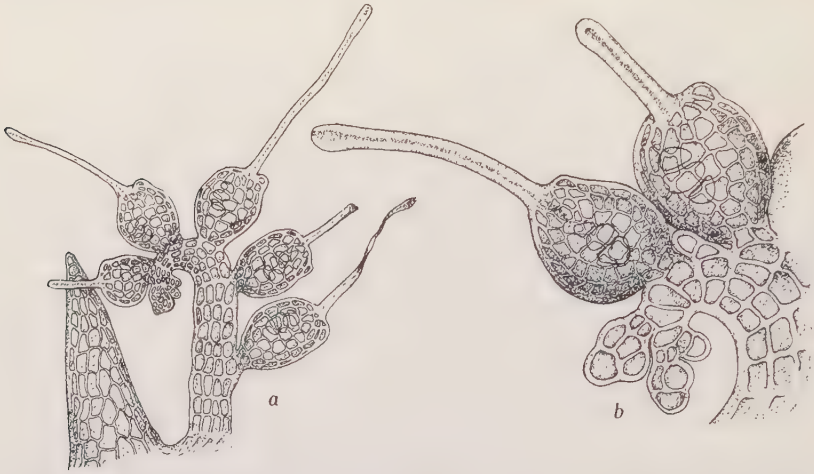


Fig. 19. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, a primary adventitious branchlet at the base of which is a fertile secondary adventitious branchlet with procarps; b, end of a fertile branchlet showing two young procarps behind the apical cell and two procarps nearly ready for fertilization (a, × 75; b, × 248).

branchlet, but I have seen up to 9 in one row. In the phase of fertilization the procarps are obliquely obovate-urn-shaped, about 60μ broad and 70μ long ; the trichogyne is long, vigorous, about 12μ thick, and 140μ long, a little thicker near the upper end. Of more or less ripe cystocarps I have seen only a few, and they seem to be always solitary. After fertilization the cystocarp destined to be developed increases much in size getting almost ball-shaped and the part of the branchlet below the cystocarp likewise gets much thicker and becomes a vigorous stalk. The undeveloped procarps are seen as remnants near the base.

I only found one antheridial body (Fig. 20a). With the exception of the basal cell it was formed by the whole trichoblast,

which was divided into numerous branchlets giving rise at their summits to spermatia. The androphore is nearly spherical, and had a diameter of about 120μ. In addition to this nearly ripe androphore the branchlet bore two young ones from which it was seen that the segments in the trichoblasts above the basal cell become plurisiphonous (Fig. 20b). The branchlet with the androphores was found upon a small piece of a thallus which otherwise bore only young stichidia and in spite of search I was not able to find other androphores.

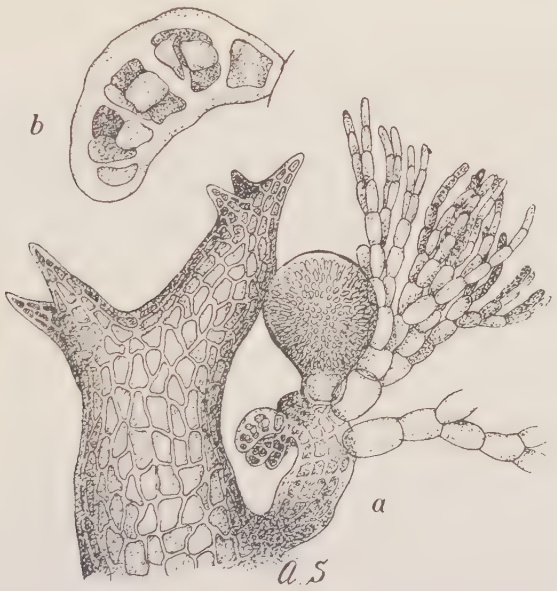


Fig. 20. *Neurymenia fraxinifolia* (Mert.) J. Ag.: a, primary and secondary branchlets, the last one bearing, besides trichoblasts, a nearly globular androphore and a few young ones; b, one of the last mentioned more magnified (a, × 110; b, × 500).

The genus *Neurymenia* has until now been considered monotypic, but the above mentioned differences as to the stichidia perhaps indicates the possibility of subspecies or varieties. It is not impossible that the vegetative thallus may exhibit differences (i.e. size of the marginal spines or distance between the nerves) and that these might prove to be constant for different geographical areas. Falkenberg has, moreover, alluded to the width of the thallus and has pointed out that forms with broader and narrower thallus are found. Specimens with narrow thallus should occur at the shores of Madagascar, Mauritius, India and Ceylon, and forms with broad thallus in Australia and Nova Caledonia. But, having seen the Kew collections, I believe a division based upon the size of the thallus does not hold good. In any case an examination of very ample material is necessary to decide all these points.

The plant was dredged in 2–3 fathoms of turbid water in the tranquil bay behind Hare Island near Tuticorin.

Distr. Indian Ocean, Japan, Australia, etc.

XV—TROPICAL AFRICAN PLANTS: X.*

Oxygonum fruticosum *Dammer* in Warb. Kunene-Sambesi Exped. 231 (1903), nomen nudum, et in Engl. Pflanzenw. Afr. iii. pt. 1, (Engl. u. Drude, Veg. der Erde, IX) 120, fig. 77c (1915), hic a *Milne-Redhead* discripta [Polygonaceae]; species ab omnibus congeneribus habitu elato fruticoso distinctissima, sed forma fructus *O. pubescenti* C. H. Wright affinis.

Frutex 0·9–1·4 m. altus; rami plus minusve virgati, adscendentes, lignosi, cortice brunneo reliquiis persistentibus ocrearum cinerearum partim tecto. *Ocreae* firme chartaceae, minutissime velutino-puberulae, cylindricae, truncatae, in toto 10–15 mm. longae, apice setoso-ciliatae, ciliis usque ad 8 mm. longis. *Folia* sessilia, lanceolata, valde acuta, basi cuneata, usque ad 4 cm. longa, 0·8 cm. lata, utraque pagina minutissime velutino-puberula, minutissime regulariter nigro-punctata, glauca. *Racemi* terminales, elongati, rigidi, circiter 25 cm. longi. *Bracteae generales* firme chartaceae, cylindricae, apice oblique truncatae, acute acuminatae, plerumque non setoso-ciliatae, glabrae vel minutissime puberulae, 7–10 mm. longae; bracteae propriae hyalinae, setis brevibus 1–2 instructae; pedicelli circiter 6 mm. longi. *Flores* ♀:—*Perianthii tubus* circiter 6 mm. longus, apicem versus leviter constrictus; lobi oblongi vel oblanceolati, circiter 8 mm. longi, apice valde acuti vel apiculati. *Stamina* 8; filamenta filiformia, 1·5–5·5 mm. longa; antherae circiter 1·3 mm. longae. *Ovarium* circiter 1 mm. longum, glabrum; styli 3, in toto circiter 9 mm. longi, apicem versus minutissime puberuli, parte inferiore in columnam 7 mm. longam connati; stigmata minuta, capitata. *Flores* ♂ non visi. *Fructus* oblongo-ellipsoideus, circiter 9 mm. longus, 5 mm. diametro, glaber, longitudinaliter sulcatus, transverse striatus.

Northern Rhodesia: Mwinilunga District: on sand in open *Cryptosepalum* woodland about 60 Km. south of Mwinilunga, and 19 Km. west of River Lunga, 23 Aug. 1930, *Milne-Redhead* 947 (type); slender shrub, up to 1 m. high; flowers white or pinkish.

Angola: Kulleis, Maramba, in white sand at the edge of the woodland, Oct. 1899, *Baum* 221; shrub 1–1·4 m. high. Here and there in short shrub-grown pasturage at Cambambe, Cuebe, 18 April 1906, *Gossweiler* 2627 (Brit. Mus. Herb.); stems numerous, densely branched; bark red-brown; leaves soft, equally green on both faces; flowers bright vine-red with white longitudinal markings outside; segments spreading, white inside; stamens white; stigmas 3, white; fruit ovate elliptic, lurid green with purplish shades. Common in the T'Chanas from Cuebe to Quembo, Luassingua, 19 June 1906,

* Continued from *K.B.* 1932, 100.

Gossweiler 2732 (Brit. Mus. Herb.) ; a suffruticose herb of vine red coloration and white flowers. Here and there in open thickets at Cassuango, Cuiriri, March 1906, *Gossweiler* 3708 (Brit. Mus. Herb.) ; flowers white and rose coloured.

Gnidia clutyoides *E. A. Bruce*, sp. nov. [Thymelaeaceae] ; affinis *G. Oliverianae* Engl. sed bracteis lanceolatis vel anguste ovatis apice acutis, tubo calycis minus dense pubescente differt.

Herba perennis, erecta, glabra, 15–25 cm. alta, radice lignosa, caulibus florentibus multis simplicibus vel raro infra apicem ramosis. *Folia* subsessilia, linearia usque lineari-lanceolata, glabra, uninervia, circiter 1 cm. longa, usque ad 1·5 mm. lata, apice acuta vel subacuta. *Capitula* terminalia, circiter 10–20-flora. *Involucri bracteae* 5–8, lanceolatae vel anguste ovatae, chartaceae, glabrae, nervis mediis prominentibus, circiter 8 mm. longae, 2·5 mm. latae, apice acutae vel subacutae. *Calycis tubus* sericeo-pubescens, infra articulum densior ; tubus superior circiter 9 mm. longus, inferior circiter 4 mm. longus, lobis circiter 2 mm. longis obovatis apice rotundatis vel leviter emarginatis extra sericeo-pubescentibus intra glabris. *Petala* 4, minuta. *Ovarium* glabrum.

Tanganyika Territory : Karagwe, near Ruvuru river, 4000–5000 ft., on dry hills, *Scott Elliot* 8128 (type), 8131 ; Bukoba District, Ndama, about 3900 ft., *A. E. Haarer* 2264.

Acacia (Vulgares-Ataxacanthae) chariessa *Milne-Redhead*, sp. nov. [Mimosaceae] ; ab *A. Lugardae* N. E. Br. foliis minoribus, spicis axillaribus brevioribus longius pedunculatis paucifloris differt.

Dumus concinnus, deciduus, fere glaber. *Rami* tenues, spinis sparsis parvis recurvis armati, purpureo-brunnei vel plus minusve glaucescentes ; spinae stipulares nullae. *Folia* bipinnata, usque 3·5 cm. longa, 2·5 cm. lata ; petioli usque ad 1 cm. longi, glandula sessili supra medium instructi ; rhachides primarii usque ad 2·5 cm. longi, superne leviter sulcati, inconspicue et minute glanduloso-pubescentes, inferne sparsim minute aculeati ; pinnae 3–8-jugae ; rhachides pinnarum usque ad 12 mm. longi ; foliola 16–26-juga, lineari-oblonga, apice rotundata, basi inaequilateralia, circiter 3 mm. longa, 0·7 mm. lata, costa leviter laterali, valde inconspicua. *Spicae* solitariae, axillares, folia aequantes vel superantes ; pedunculi usque 2 cm. longi, rarissime minute aculeati ; spicae usque ad 2 cm. longae, circiter 1 cm. diametro, 15–30-florae. *Flores* sessiles, ochroleuci vel fere albi. *Calyx* campanulatus, 5-dentatus, dentibus obtusis vel subacutis 0·5 mm. longis, circiter 2·5 mm. longus. *Petala* libera vel leviter coalita, oblongo-lanceolata, acuta, circiter 3 mm. longa. *Stamina* filiformia, circiter 6 mm. longa, antheris minutis. *Ovarium* glabrum, oblongum, stipitatum (stipite 1 mm. longo), circiter 1 mm. longum ; stylus filiformis, circiter 5 mm. longus. *Legumen* rectum, planum, lineari-oblongum, stipitatum, apice conspicue rostratum, in toto usque ad 7 cm. longum, 1·3 cm. latum, margine plus minusve undulatum, purpureo-brunneum, seminibus 1–5.

Southern Rhodesia: Bulawayo District: Bulawayo, altitude about 4400 feet, 9 Dec. 1920, *Borle* 13 (type); a common bush with scented white flowers. Bulawayo, in the veldt, flowering during the wet season, Dec. 1904, *Gardner* 89. Bulawayo, altitude about 4465 ft., in fruit, 18 Feb. 1912, *Rogers* 5741. Bulawayo, July 1898, *Rand* 450 (Brit. Mus. Herb.). Nahla, Dec. 1923, *Steedman* 61; a graceful, feathery bush with epidermal thorns and spikes of pale yellow flowers, rare here, but abundant round Bulawayo; did not see fruit. Victoria District: Victoria, without date, *Monro* 2170 (Brit. Mus. Herb.).

Albizzia (Eualbizzia-Microphyllae) struthiophylla *Milne-Redhead*, sp. nov. [Mimosaceae]; ab *A. Harveyi* Fourn. pinnis valde numerosis, pedunculis ebracteatis, foliolis obtusis rectis differt.

Arbor parva, circiter 6 m. alta, decidua, ramis diffusis. *Ramuli* vetustiores glabri vel puberuli; ramuli novelli dense flavo-tomentosi. *Folia* gracilia, usque ad 23 cm. longa, 5 cm. lata; petioli 2·5 cm. longi, tomentosi, glandulis inconspicuis supra petiolos haud multum elevatis vix 2 cm. a basi ortis; foliorum rhachides 20 cm. longi, ultra pinnas terminales breviter prolati, tomentosi, apicem versus inter pinnas glandulosi; pinnae suboppositae, 25–45-jugae; pinnarum rhachides 5 cm. longi, ultra foliola terminalia prolati, tomentosi; foliola 25–45-juga, sessilia, oblonga, recta, apice rotundata, basi obliqua, inaequilateralia, 4 mm. longa, 1 mm. lata, subtus glabra vel parcissime puberula, supra glabra, margine flavo-hirsuta; costae mediae plus minusve sulcatae; nervi laterales inconspicui; stipulae caducae, lineari-subulatae, 4 mm. longae, extra dense flavo-tomentosae, intus glabrae. *Inflorescentiae* 1–3 ex axillis foliorum ortae, capitatae; pedunculi 3·5 cm. longi, flavo-tomentosi, ebracteati; capitula globosa, circiter 35-flora, bracteis minutissimis flores subtendentibus; flores plerique hermaphroditi, tantum duo flores ad apicem capitulorum siti masculi. *Flores* ♀ breviter pedicellati:—*Calyx* campanulatus, brevissime lobatus, 3 mm. altus, lobis obtusis 0·2 mm. longis 0·8 mm. latis breviter flavo-hirsutis. *Corolla* ochroleuca, infundibuliformis, 6 mm. longa, parce flavo-hirsuta, fere ad medium lobata, lobis ovato-lanceolatis subacutis ad apicem densius flavo-hirsutis. *Stamina* ochroleuca, numerosa, glabra, basin versus in tubum 2–3 mm. longum vix 1 mm. latum connata, 20 mm. longa, filiformia, antheris minutis. *Ovarium* glabrum, 2 mm. longum, stylo filiformi 17 mm. longo. *Flores* ♂ sessilia:—*Calyx* late infundibuliformis, 3 mm. altus, profunde lobatus, lobis late ovatis obtusis 2·5 mm. longis 2·5 mm. latis breviter flavo-hirsutis. *Corolla* ochroleuca, infundibuliformis, 7 mm. longa, parce flavo-hirsuta, fere ad medium lobata, lobis lanceolato-acutis ad apicem densius flavo-hirsutis. *Stamina* pallide rosea, numerosa, glabra, medium versus in tubum 10 mm. longum 3 mm. diametro connata, 20 mm. longa, filiformia, antheris minutis. *Ovarium* ad discum redactum. *Legumen* late-lineare, rectum, plano-compressum, undulatum, 16 cm. longum, 3·5 cm. latum, dehiscens.

Northern Rhodesia : Mazabuka District : in *Acacia* grassland at Mazabuka, 6 Oct. 1930, *Milne-Redhead* 1207 (type) ; small tree, 6 m. high ; young leaves and flowers obtained, flowers in creamy white globular heads ; most flowers hermaphrodite, two male flowers in each head ; male flowers larger with a longer staminal tube which is pinkish ; last season's fruits still on the tree. Pemba, 30 Oct. 1911, *Rogers* 8926. Chilanga District : Quein Sabe, 8 Oct. 1929, *Mrs. Sandwith* 35 ; a tree with white flowers. The Argosy Copper Mine, Quien Sabe, 11 Oct. 1929, *Mrs. Sandwith* 48.

Southern Rhodesia : Lomagundi District : 1080 m. altitude, without exact locality, Oct. 1930, *Eyles* 3793. Hartley District : without precise locality, in fruit, June 1930, *Jack* s.n. (*Govt. Herb. Salisbury* 5072). Bulawayo District : Bulawayo, on schist about 4469 ft. altitude, Oct. 1902, *Eyles* 1090 (Brit. Mus. Herb.) ; a large tree with yellow flowers. Bulawayo, Nov. 1908, *Chubb* 386 (Brit. Mus. Herb.). Victoria District : Victoria, 1909, *Monro* 558 (Brit. Mus. Herb.).

Ceropegia filicalyx *Bullock*, sp. nov. [Asclepiadaceae] ; *C abyssinicae* Decne. affinis sed calyce duplo longiore, corollae lobis minoribus, indumento densiore, habitu majore differt.

Herba erecta usque ad 1 m. alta, caulibus simplicibus patente hirsutis. *Folia* anguste oblonga vel oblanceolato-oblonga, apice subacuta vel obtusa, basi gradatim angustata, 6–12 cm. longa, 1–2 cm. lata, supra subadpresso-pilosa, infra satis dense patente pilosa, nervis lateralibus utrinsecus circiter 7, petiolis usque ad 1 cm. longis. *Flores* in axillis 3–5, fasciculati, pedicellis gracilibus usque ad 2 cm. longis patente villoso-hirsutis. *Calyx* fere ad basin 5-lobatus, lobis filiformibus 1 cm. longis hirsutis. *Corolla* 2·3 cm. longa, lobis 6 mm. longis apice cohaerentibus, tubo 1·7 cm. longo medio 5 mm. diametro, coronae lobis 2 mm. longis, supra antheras in appendicibus crassis linearibus apice cohaerentibus 1·5 mm. longis productis. *Fructus* non visi.

Tanganyika Territory : Kikori, 4200 ft., a very local erect herb about 3 ft. high, growing in *Acacia usambarensis* woodland, 14 May 1930, *B. D. Burtt* 2755 (type) ; Moshi, about 3000 ft., June 1928, *Haarer* 1493.

This interesting plant is very closely allied to *C. abyssinica* Decne., and as in that species the otherwise brownish-purple corolla has a broad cream-coloured band encircling the tube, this colour being repeated on the backs of the corolla-lobes. *C. filicalyx* is also very near to *C. Bequaertii* De Wild., a plant from the Belgian Congo, and known to me only from the description.

Huernia Verekeri *Stent*, sp. nov. [Asclepiadaceae] ; forma coronae aspectu *Duvaliae* sed dentibus inter lobos corollae *Huerniae* valde distincta.

Caules circiter 3·5–5 cm. alti, glabri, 5–7-angulati, dentibus usque ad 8 mm. longis tenuiter acuminatis e basi deltoidis. *Flores* e basi caulis 1–3-fasciculati, pedicellis 8 mm. longis glabris viridibus.

Calycis lobi ovati, acuminati, in cuspidem longam tenuem angustati, circiter 7 mm. longi, glabri. *Corolla* tubo vadoso cupuliformi 4 mm. alto et 9 mm. diametro, inter lobos dente parvo reflexo instructa, lobis horizontaliter patentibus 7 mm. longis, pallide flavo-viridibus setis purpureis minutis indutis, tubo basi albo apicem versus fere rubro glabro praeter setas circum apicem. *Corona* exterior alba, crassa, disciformis, interior lobis antheris incumbentibus, quam antheris brevioribus, crista dorsali late rotundata plana satis magna albida vel roseo leviter suffusa ornata.

Southern Rhodesia: Sabi Valley, *L. A. Vereker*; flowering in Mr. Basil Christian's garden at Ewanrigg, Salisbury, *Govt. Herb. Salisbury* 5427 (type).

Pentas graniticola *E. A. Bruce*, sp. nov. [Rubiaceae]; affinis *P. longitubae* K. Schum. sed glabra et minor.

Suffrutex glaber, ramis basi crassis succulentis. *Folia* lanceolata vel ovato-lanceolata, utrinque glabra, 7–13 cm. longa, 1–4 cm. lata, apice acuminata, basi anguste cuneata, nervis lateralibus utrinsecus circiter 10, petiolis anguste alatis usque ad 1 cm. longis. *Stipulae* 6-laciniatae, lacinis subulatis circiter 1·5 cm. longis. *Inflorescentia* cymosa, terminalis, glabra, floribus breviter pedicellatis. *Calyx* glaber, tubo campanulato circiter 5 mm. longo, lobis 5 linearibus persistentibus usque ad 2 cm. longis. *Corolla* glabra, 5-lobata, lobis oblongo-lanceolatis circiter 1 cm. longis, tubo anguste cylindrico apice dilatato usque ad 9 cm. longo, staminibus et stylo inclusis. *Fructus* anguste ovoideus, glaber, 10-costatus, calycis lobis persistentibus.

Tanganyika Territory: Coast of Speke Gulf, Lake Victoria, near Mwanza, 3740 ft.; a semi-succulent plant with long, white, tubular, jasmine-scented flowers growing in the cracks of granite rocks, *B. D. Burtt* 2497 (type). Shinyanga District, in the Mantini Hills, 4000 ft.; a white, tubular, sweet-scented flowered plant, the base of the stem succulent and swollen; growing on exposed hill-tops in the cracks of great granite rocks, *B. D. Burtt* 2458.

Canthium Burttii *Bullock*, sp. nov. [Rubiaceae]; *C. lactescenti* Hiern affine sed ramulis novellis pubescentibus, foliis minoribus utrinque dense pubescentibus, floribus majoribus minus numerosis differt.

Arbor vel plerumque *frutex* usque ad 6·5 m. altus; caules maturi glabri, crassi, cortice primum saturate purpurei, demum pallide cinerea; ramuli juniores graciles, subtetragoni, dense patulo-pubescentes, apice bifoliati, usque ad 5·5 cm. longi vel saepe breviores. *Stipulae* persistentes, triangulares, apice acutissimae, usque ad 1·3 cm. longae et 1 cm. latae, marginibus membranaceae, extra demum subglabrae. *Folia* opposita, elliptica vel ovata usque fere rotundata, apice breviter et abrupte acuminata vel acuta, basi acuta vel cuneata, 3·5–5·5 cm. longa, 2·5–3 cm. lata, utraque dense velutino-pubescentia, nervis lateralibus valde adscendentibus utrinque circiter 5. *Cymae*

ex axillis foliorum annotinorum delapsorum orti; pedunculi velutino-pubescentes, circiter 1–1·5 cm. longi, floribus apice dense glomeratis; pedicelli graciles, glabrescentes, 1–3 mm. longi; bracteae non visae. *Calyx* truncatus vel undulatus, limbo minutissimo vel fere obsoleto, glaber. *Corolla* pallide luteo-viridis, tubo cylindrico 2 mm. longo, lobis 5 ovatis subacutis 2·5 mm. longis patentibus, alabastro apice rotundata. *Stamina* 5; antherae ellipticae, 1·75 mm. longae; filamenta brevissima, filiformia. *Ovarium* turbinatum, glabrum, 1 mm. longum; stylus 2·5 mm. longus, basin versus adpresse pubescens, stigmate cylindrico 0·75 mm. longo sulcato. *Fructus* non visi.

Tanganyika Territory: Manyoni Copje, among granite rocks, 4100 ft., a spreading tree, or usually a shrub, up to 20 ft. high, with pale yellowish-green flowers, 13 Dec. 1931, *B. D. Burtt* 3542.

Although closely allied to *Canthium lactescens* Hiern, this is at once distinguished by the velvety leaves and young branchlets, and the less numerous flowers which form an almost globose cyme at the apex of the peduncle. The growth form is interesting. When the terminal bud opens at the commencement of each growth-season, the main axis is continued, and terminates in two leaves and a terminal bud; at the base two lateral and smaller, though otherwise similar, shoots arise, while at practically the same level, in a plane at right angles, the peduncles are borne. Presumably, the cymes actually arise from the axils of the fallen leaves of the previous year, while the lateral branchlets arise from buds in the axils of scale leaves of the terminal bud. Occasionally three lateral shoots arise, but there are never more than two cymes. In the case of lateral buds, delayed development is indicated. From each opposite lateral bud one cyme and one branchlet arise, so that if the intervening internodes were removed, the branchlets and cymes would appear exactly as though produced from a terminal bud. The latter occasionally remains undeveloped, a few flowers being produced instead; this condition, however, is abnormal.

Tapiphyllum Fadogia *Bullock*, sp. nov. [Rubiaceae-Vanguerieae]; *T. confertifloro* Robyns valde affine sed foliis ternatis, floribus congestis multo numerosioribus, bracteis minoribus ternatis facile distinguitur.

Caules herbacei, medullosi, erecti, dense fulvo-tomentosi, internodiis usque ad 8·5 cm. longis. *Stipulae* subtriangulares, vaginatim connatae, intus villosae, usque ad 4 mm. longae, in caudam subulatam usque ad 8 mm. longam desinentes. *Folia* ternata, elliptica, apice abrupte et breviter acuminata, basi rotundata, 7–8 cm. longa, 4·5–5·5 cm. lata, supra densissime pubescentia, subtus flavescenti-tomentosa, nervis lateralibus subtus prominentibus utrinsecus 6–8; petioli 5 mm. longi. *Flores* subsessiles, in cymas tomentosas axillares multifloras congesti, basi bracteis 3 linearibus leviter inaequalibus instructi, pedunculis 10–12 mm. longis. *Calyx* usque ad 6-lobatus, lobis linearibus plerumque leviter inaequalibus 3–5 mm.

longis, tubo 2·5 mm. longo. *Corolla* extra dense tomentosa, alabastro apiculo 2 mm. longo praedita, 5-lobata, lobis intus glabris circiter 5 mm. longis, tubo 5 mm. longo intus pilis reflexis annulato. *Antherae* parvae, subexsertae, subsessiles. *Stylus* 7 mm. longus; stigma exsertum, 1 mm. longum, coroniforme, sulcatum. *Fructus* non visi.

Tanganyika Territory: Muhutive, Bukoba District, about 4000 ft., June 1931, *A. E. Haarer* 2033.

The writer is much indebted to Dr. W. Roybns, of Brussels, who very kindly examined this plant, and declared it to be a species unknown to him. The verticillate leaves give it some resemblance to the allied genus *Fadogia*.

Tapiphyllum grandiflorum *Bullock*, sp. nov. [Rubiaceae-Vanguerieae]; *T. confertifloro* Robyns affine sed foliis majoribus basi cordatis, pedunculis multo brevioribus, floribus majoribus differt.

Caules herbacei, medullosi, erecti, cylindrici, sed superne plus minusve compressi, flavescenti-tomentosi, internodiis circiter 7 cm. longis. *Folia* opposita, ovata vel oblongo-ovata, apice subacuta, vix acuminata, basi cordata, 7–9 cm. longa, 4·5–5·5 cm. lata, supra dense pubescentia, subtus flavescenti-tomentosa, nervis lateralibus utrinsecus circiter 6; petioli usque ad 5 mm. longi. *Flores* in cymas tomentosas simplices axillares 5–8-floras dispositi, basi bracteis duabus linearibus instructi, pedunculis usque ad 5 mm. longis. *Calyx* 5-lobatus, lobis saepe inaequalibus late linearibus circiter 5–8 mm. longis, tubo 5 mm. longo. *Corolla* extra dense tomentosa, albastro apiculo 2 mm. longo praedita, 5-lobata, lobis intus glabris circiter 6 mm. longis, tubo 6 mm. longo et 4 mm. diametro, intus pilis reflexis annulato. *Antherae* exsertae, 1 mm. longae, subsessiles. *Stylus* 8 mm. longus; stigma exsertum, coroniforme, profunde sulcatus, fere 2 mm. longum. *Fructus* non visi.

Northern Rhodesia: Mumbwa, *Mrs. Macaulay* 922.

The very broad corolla-tube and large cordate leaves of this species render it strikingly different in general appearance from its ally, *T. confertiflorum* Robyns.

Lagynias littoralis *Bullock et Greenway*, sp. nov. [Rubiaceae]; *L. pallidiflorae* Bullock affinis sed floribus foliisque multo majoribus valde distincta.

Arbor glabra, circiter 8 m. alta, ramulis teretibus cortice pallide griseo. *Folia* leviter discoloria, oblonga usque anguste oblongo-elliptica, apice late obtusiuscule subacuminata, basi acuta, 8–12 cm. longa, 3–5 cm. lata, petiolis 9–12 mm. longis; stipulae mox deciduae, longe subulatae, basi latae, parte subulata circiter 1 cm. longa. *Cymae* axillares, brevissime pedunculatae, circiter 4–6-florae, pedunculis 2–3 mm. longis, pedicellis 1·5–2·5 cm. longis. *Calyx* persistens, usque ad receptaculum 5-lobatus, lobis oblongo-spathulatis obtusis 1·3 mm. longis; receptaculum subglobosum, 2·5 mm.

diametro. *Corolla* mox decidua, non visa. *Ovarium* 5-loculare, loculis 1-ovulatis. *Drupa* abortu bi- vel unilocularis, calyce non accrescente coronata, loculis ellipsoideis 1·5 cm. longis 1 cm. latis.

Pemba Island : Ngezi Forest, in dense shade ; a very common tree up to 25 ft. high, with greenish-white flowers, 11 Dec. 1930, *P. J. Greenway* 2697 (type).

Kenya Colony : Kwale ; *sub R. M. Graham* 1691 *in Herb. Kew.*

In an observation following the description of *Lagynias pallidiflora* Bullock in Kew Bull. 1931, 273, the Kwale specimen cited above is mentioned as being probably a new species of the genus. The collector on his label describes it as a "large forest climber," a hundred feet in height, and four inches in diameter towards the base. There seems to be no doubt that the label refers to another plant, since the specimen is certainly conspecific with the Pemba plant which has been made the type of this species.

Helichrysum acrobates *Bullock*, sp. nov. [Compositae] ; *H. abyssinico* Sch. Bip. affine sed foliis brevioribus latioribus, indumento breviore adpressiore, capitulis majoribus differt ; ab *H. trilineato* DC., cui maxime affine, indumento densiore, capitulis majoribus, inflorescentia densiore recedit.

Fruticulus ambitu orbiculari usque ad 2 dm. altus, dense foliatus, dense adpresse albo-lanato-tomentosus. *Folia* subspatulato-oblonga, minute mucronata, inferiora usque ad 1·5 cm. longa et 3–5 mm. lata, superiora minora, e basi amplexicauli 3-nervia. *Rami floriferi* dense foliati, non ramosi ; capitula numerosa in corymbas densas usque ad 3 cm. diametro disposita. *Capitulum* late campanulatum, circiter 5–7 mm. diametro ; bracteae involucri aureo-luteae, multiseriatae, lanceolatae, acutae, usque ad 5 mm. longae, membranaceae. *Flores hermaphroditi* circiter 70–80. *Pappi setae* 8–10, minute barbellatae. *Achaenia* breviter pubescentia.

Tanganyika Territory : Summit of Hanang Mt. (Guruwe Mt.), Mbulu District, 11,182 ft., growing in tufts among the rocks, with yellow flowers, 26 Dec. 1929, *B. D. Burtt* 2279.

This species belongs to the section *Chrysantha*, subgenus *Euhelichrysum*.* It differs from *H. abyssinicum* in its shorter, more closely adpressed indumentum and larger capitula. The leaves are also much broader and shorter than in that species.

Pulicaria attenuata *Hutch. et B. L. Burtt*, sp. nov. [Compositae] ; foliis spatulato-oblanceolatis ad basin longe attenuatis ubique glandulosis et breviter molliter pubescentibus distincta.

Herba usque ad 30 cm. alta, ubique glandulosa et breviter molliter pubescens ; caulis ramique costati. *Folia* spatulato-oblanceolata, ad basin longe attenuata, apice subacuta, 4–5 cm. longa circiter 1 cm. lata, nervis lateralibus circiter 3, superne leviter dentata. *Capitula* pedunculata, late campanulata, circiter 1 cm.

* Moeser, "Die Afrikanischer Arten der Gattung Helichrysum," in Engl. Bot. Jahrb. xliii., 420-460 (1909), et *op. cit.* xliv. 239-345 (1910).

diametro ; pedunculi saepe circiter 5 cm. interdum usque ad 12 cm. longi, paucibracteati. *Involucri bracteae* circiter 3-seriatae, lineares, 6–7 mm. longae, extra dense pubescentes. *Flores* radii flavi, tubo pubescente et ligula brevi apice denticulata, *Flores* disci numerosi. *Achaenia* costata, adpresse pubescentia. *Pappus* duplex, serie exteriore cupulata, profunde incisa, interiore setosa, setis albidis circiter 10 corollae aequilongis minute barbellatis.

Eastern Sudan : Darfur ; Malha, Jebel Meidob, in clay soil, strongly aromatic, Sept. 1930, *A. P. G. Michelmore.*

Guizotia oblonga (*Hutch.*) *Hutch. et Bullock*, comb. nov. [Compositae] ; *Wedelia oblonga* Hutch. in Gard. Chron. Ser. 3, xlv. 18 (1909).

A large number of specimens of this species, from Kenya Colony and Uganda, are now preserved in the Kew Herbarium. It was originally described from a plant raised from seed collected by Diespecker in Kenya Colony by Messrs. J. Veitch & Son in this country, and from a specimen collected by Whyte in the Eldama Ravine. It may be noted that the *Index Kewensis* reference to the original description is wrong, and should be as above instead of " Kew Bull. 1909, 18."

Tinnea Physalis *E. A. Bruce*, sp. nov. [Labiatae] ; affinis *T. vesiculosae* Gürke sed foliis crenatis, bracteis majoribus differt.

Frutex usque ad 1·3 m. altus, ramis quadrangularibus pubescentibus. *Folia* opposita, longe petiolata, ovata, acuminata, basi late cuneata, margine crenato ; laminae 4–7 cm. longae, 2–4 cm. latae, infra valde supra leviter pubescentes, utrinque dense glandulosae, nervis lateralibus utrinsecus circiter 4, petiolis usque ad 2 cm. longis dense pubescentibus. *Inflorescentia* terminalis. *Flores* graciliter pedicellati, in axillis bractearum majorum dispositi. *Bracteae* foliaceae obovatae vel oblanceolatae, apice longe acuminatae, basi cuneatae, leviter pubescentes et glandulosae, circiter 2·5 cm. longae. *Calyx* bilabiatus, pubescens et glandulosus, oblongus, circiter 1·5 cm. longus, valde accrescens, in fructu circiter 3·5 cm. longus, 2 cm. latus, vesiculosus, membranaceus, basi cordatus, labiis brevibus rotundatis, nervis longitudinalibus circiter 14. *Corolla* pubescens in calyce inclusa.

Tanganyika Territory : Shinyanga District ; Mantini Hills, 4000 ft. ; a loosely branched shrub up to 4 ft. high, growing on the summit of granite hills in the shade of *Commiphora kyimbelensis*, frequent locally, *B. D. Burtt* 2501 (type).

Carex Mannii *E. A. Bruce*, sp. nov. [Cyperaceae] ; affinis *C. Boryanae* Schkuhr sed spiculis brevioribus, foliis rigidis basi purpureis, glumis abrupte acuminatis differt.

Rhizoma caespitosum. *Culmus* circiter 80 cm. altus. *Folia* culmum subaequalia, 4–6 mm. lata, rigida, basi purpurea. *Inflorescentia* anguste paniculata, circiter 20 cm. longa, interrupta. *Spiculae*

circiter 9, elongato-cylindricae, circiter 5 cm. longae, densiflorae, terminales mere ♂ vel basi breviter ♀, caeterae plerumque ♀, vel apice pauce ♂, inaequaliter pedunculatae, pedunculis scabris. *Rhachis* scabra. *Bracteae* foliaceae. *Glumae* lanceolatae, abrupte acuminatae, apiculatae, rubro-purpureae, media nerva viride. *Utriculi* squamis longiores, anguste ovoidei, circiter 5 mm. longi, rostris circiter 2 mm. longis. *C. Boryana* var. *minor* Boott. Illustr. iii. 111 (1862), partim, quoad t. 348. *C. Boryana* C. B. Cl. in Dyer, Fl. Trop. Afr. viii. 523 (1902), non Schkuhr. *C. Boryana* var. *simplicissima* Kükenth. in Engl. Pflanzenr. Cyperac.-Caricoid. 651 (1909), partim.

Fernando Po: Clarence Peak, 7500 ft., *Mann* 1478 (type); 8500 ft. *Mann* 661.

Cameroons Mountain: Ukele Camp, 6000 ft., in open part of forest and in grassland, *Maitland* 1341.

Uganda: Ruwenzori, over 10,000 ft., in short bush, May, *Scott Elliot* 7873.

XVI—SILENE CUCUBALUS: THE CORRECT NAME OF THE BLADDER-CAMPION.

T. A. Sprague and M. L. Green.

The case of the Bladder-campion has long been regarded as one of the most difficult in the realm of nomenclature. Six different names have been adopted for it by experienced botanists during the last twenty-five years, mainly owing to differences in the interpretation of the International Rules of Nomenclature. These names are *Silene Cucubalus* Wibel, *S. inflata* (Salisb.) Sm., *S. venosa* (Gilib.) Aschers., *S. vulgaris* (Moench) Garcke, *S. latifolia* (Mill.) Britt. et Rendle, *S. angustifolia* (Mill.) Briq. The difficulties experienced in this connection related chiefly to nomina abortiva (illegitimate names), that is, names formed in contravention of the International Rules, and to the use of later homonyms. Two views prevailed as to the latter, some botanists considering that a later homonym could be adopted if the earlier homonym was rejected on *taxonomic* grounds, and others that it could be adopted only if the earlier homonym was *nomenclaturally* invalid.

At the International Botanical Congress held at Cambridge in 1930, certain alterations were made in the Rules, perhaps the most important being the rejection of all later homonyms of validly published names. Names that appeared only as nomina nuda are of course not validly published, and have no status under the Rules, but illegitimate names that are validly published must not be duplicated. It may be explained parenthetically that there are two essentials for "valid publication" of a name: (1) effective circulation, for example, by printing and placing on sale to the general public; (2) the provision of a description or a reference to a former description under another name. Hence the apparent paradox that an illegitimate name can be "validly published."

Under the new Rules there is no doubt that *Silene Cucubalus* Wibel is the correct name for the Bladder-campion. The detailed synonymy of the species is given below in chronological order.

Synonymy of the Bladder-campion.

Square brackets enclosing an author's name indicate that the trivial as originally proposed by that author was illegitimate.

1. *Cucubalus Behen* L. Sp. Pl. ed. 1, 414 (1753).
2. *Cucubalus latifolius* Mill. Gard. Dict. ed. 8, no. 2 (1768).
3. *Cucubalus angustifolius* Mill. l.c. no. 3.
4. *Lychnis Behen* (L.) Scop. Fl. Carn. ed. 2, i. 305 (1772).
5. *Cucubalus venosus* Gilib. Fl. Litvan. Collect. v. 165 (1782).
6. *Behen vulgaris* Moench, Meth. 709 (1794).
7. *Cucubalus inflatus* Salisb. Prodr. 302 (1796).
8. *Silene Cucubalus* Wibel, Prim. Fl. Werth. 241 (1799).
9. *Silene inflata* [Salisb.] Sm. Brit. Bot. 467 (1800).
10. *Viscago Behen* (L.) Hornem. Hort. Hafn. 409 (1813).
11. *Silene vesicaria* Schrad. ex Reichb. Fl. Germ. Excurs. 823 (1832).
12. *Silene Behen* (L.) Wirzen, Enum. Pl. Offic. Fenn. 36 (1837), non L. (1753).
13. *Silene crispata* Stev. in Bull. Soc. Nat. Mosc. xxix. pt. 1, 315 (1856), in textu.
14. *Silene Wallichiana* Klotzsch in Klotzsch & Garcke, Bot. Ergebn. Waldem. Reise, 139 (1862).
15. *Silene venosa* [Gilib.] Aschers. Fl. Brandenb. i. 86 (1864).
16. *Oncerum globosum* Dulac, Fl. Hautes-Pyr. 258 (1867).
17. *Behen vesicarius* [Schrad.] Fourr. in Ann. Soc. Linn. Lyon, n.s. xvi. 343 (1868).
18. *Silene vulgaris* [Moench] Garcke, Fl. Deutschland, ed. 9, 64 (1869).
19. *Behenantha inflata* [Salisb.] Schur in Verh. Nat. Ver. Bruenn, 1876, xv. pt. 2, 131 (1877).
20. *Silene pseudo-Behen* Schur ex Nyman, Consp. 88 (1878).
21. *Silene latifolia* (Mill.) Britt. et Rendle, List Brit. Seed Plants and Ferns, 5 (1907), non Poir. (1789).
22. *Silene angustifolia* (Mill.) Briq. Prodr. Fl. Corse, 543 (1910), non Poir. (1789).

Analysis of the synonymy.

One of the basic provisions of the International Rules is that each species must bear the *earliest* validly published legitimate epithet available under the particular generic name. All that is necessary, therefore, is to consider each name in chronological order, and to ascertain whether it was both validly published and legitimate, and if so, whether the specific epithet can be employed for the species under the generic name adopted—in this case *Silene*.

Nos. 1, 4, 10, 12. The earliest specific epithet, *Behen*, cannot be adopted under *Silene*, as the resulting combination *S. Behen* (L.) Wirzen (1837) is a later homonym of *S. Behen* L. (1753).

Nos. 2, 3, 21, 22. The epithets *latifolius* and *angustifolius* cannot now be used under *Silene*, since the resulting combinations *S. latifolia* (Mill.) Britt. et Rendle (1907), and *S. angustifolia* (Mill.) Briq. (1910) are later homonyms of the validly published names *S. latifolia* Poir. (1789) and *S. angustifolia* Poir. (1789) respectively.

Nos. 5, 15. *Cucubalus venosus* Gilib. (1782) is illegitimate, being a superfluous name for *C. Behen* L. (1753). The date of an epithet for purposes of priority is that of its valid publication as a *legitimate* epithet. The epithet *venosus* therefore does not possess priority from 1782. *Silene venosa* Aschers. (1864) is accordingly treated under the Rules, not as a new *combination*, but as a new *name* for purposes of priority. It is superfluous, being a later name for *S. Cucubalus* Wibel (1799).

Nos. 6, 18. *Behen vulgaris* Moench (1794) is an illegitimate name. It is true that Moench could not adopt the earliest epithet *Behen*, because that would have resulted in the creation of a tautonym, but he included *Cucubalus latifolius* Mill. in the species, and should therefore have adopted the epithet *latifolius* under the generic name *Behen*. As in the preceding case, the epithet *vulgaris* did not acquire priority by its appearance in an illegitimate combination. *Silene vulgaris* Garcke (1869) is accordingly a superfluous name for *S. Cucubalus* Wibel (1799).

Nos. 7, 9, 19. *Cucubalus inflatus* Salisb. (1796) is illegitimate, being a superfluous name for *C. Behen* L. (1753) : Salisbury arbitrarily changed the name because he did not like generic names being used as specific epithets. Here again, the epithet, *inflatus*, gained no priority by its publication as part of an illegitimate name. *S. inflata* Sm. (1800) is accordingly a superfluous name for *S. Cucubalus* Wibel (1799).

In 1799, when Wibel transferred the species to *Silene*, there were three legitimate epithets for it (all under *Cucubalus*), namely, *Behen*, *latifolius* and *angustifolius*, and three epithets which had appeared in illegitimate combinations, namely *venosus*, *vulgaris* and *inflatus*. As shown above, the adoption by Wibel of any of the three legitimate epithets would have resulted in the creation of a later homonym. He was therefore free, either to propose a new specific epithet, or to adopt one of the three which had previously appeared in illegitimate combinations. He chose the new name *Silene Cucubalus*, and this is therefore the correct name (under *Silene*) according to the International Rules.

Nos. 11, 17, 20. *Silene vesicaria* Schrad. ex Reichb. (1832) and *S. pseudobehen* Schur ex Nyman (1878) were not validly published, since they appeared only in synonymy.

No. 13. *Silene crispata* Stev. (1856) was a legitimate name for a new species distinguished by Steven from *S. inflata* (*S. Cucubalus*). If treated as conspecific with the latter, it falls into synonymy.

No. 14. *Silene Wallichiana* Klotzsch (1862) was also published as a new species. The same remarks apply.

No. 16. *Oncerum globosum* Dulac (1867) was published as a new name for *Silene inflata* Sm., and was therefore illegitimate, being superfluous.

It is highly satisfactory that the revision of the International Rules at Cambridge in 1930 has made it possible to determine with certainty the correct name in such a complicated and formerly controversial case.

XVII—THE HISTORY OF NOTHOPANAX.

T. A. Sprague and M. L. Green.

The generic name *Nothopanax* (Araliaceae) was proposed in 1855 by Miquel (Fl. Ind. Bat. i. pt. 1, 765) for a group of shrubby species from southern Asia, Oceania and New Zealand. Of these he mentioned only five species from the Dutch East Indies, since the genus was published in his flora of that area. The Oceanic and New Zealand species being unspecified, the type of the name *Nothopanax* is to be sought among the five Asiatic species actually mentioned by Miquel as belonging to the genus. Four of these, namely *N. fruticosum* (L.) Miq., *N. obtusum* (Bl.) Miq., *N. pinnatum* (Lam.) Miq. and *N. Anisum* (DC.) Miq. were referred to *Polyscias* Forster (1776) by Harms (Engl. u. Prantl, Pflanzenfam. iii. Abt. 8, 45 : 1894). The fifth, *N. cochleatum* (Lam.) Miq., which Harms had not seen, was retained by him under *Nothopanax*, in which he included also nine species from New Zealand and one each from Tasmania, Tahiti and China (l.c. 48).

Apparently the only material difference between *Polyscias* and *Nothopanax* (*sensu* Harms) is that the leaves of the former are *pinnate* (simply pinnate, bipinnate or tripinnate), whilst those of the latter are *digitate* or *simple*. The ovary of *Polyscias* is 2–10-locular, and that of *Nothopanax* is 2–4-locular, according to Harms (ll. cc.). *N. cochleatum* (Lam.) Miq. has simple or trifoliolate leaves, and a 3–5-merous gynoecium, according to the figures given by Koorders and Valeton (Atlas Baumart. Java, t. 697 : 1916). On the leaf characters, *N. cochleatum* therefore falls under *Nothopanax* Miq. emend. Harms. The number of loculi does not seem to possess much significance.

The correct application of the name *Nothopanax* Miq. now remains to be considered. It is clear from Miquel's description (l.c.) that he regarded his genus as one natural group with a wide range of characters as regards the leaves, and in which no one element was more typical than another. This is shown by the phrase " Frutices foliis pinnato-decompositis, digitatis, pinnatis vel simplicibus," where " digitatis " is intercalated between " pinnato-decompositis " and " pinnatis." There is nothing to show that he considered any one species as a " type." The type-method had not then (1855)

been developed. *Prima facie* it might appear that one of the four pinnate-leaved species mentioned by Miquel should have been chosen as lectotype, rather than the fifth which was simple-leaved ; and *N. fruticosum* (L.) Miq. has actually been treated as the type (Philipp. Journ. Sc., Bot. vii. 241 : 1912). But Miquel obviously included also the six simple and digitate-leaved New Zealand species of *Panax* recognized in 1853 by J. D. Hooker (Fl. N.Z. i. 93). There were therefore in *Nothopanax* Miq. (1855) 4 pinnate-leaved species as against 7 with simple or digitate leaves. When *Nothopanax* Miq. was divided, the pinnate-leaved species were transferred to *Polyscias*, leaving only the simple and digitate group. It was therefore legitimate to retain the name *Nothopanax* Miq. for the latter, since Miquel had not indicated a type. As *N. cochleatum* (Lam.) Miq. was the only member of this group specified by Miquel, it has strong claims to be chosen as lectotype. The relevant synonymy of *Polyscias* and *Nothopanax* is appended.

Polyscias *J. R. et G. Forst.* Char. Gen. 63, t. 32 (1776) ; Dalla Torre et Harms, Gen. Siphonog. 363, n. 5859 (1903). *Nothopanax* Miq. (Fl. Ind. Bat. i. pt. 1, 765 : 1855), partim (species foliis pinnato-decompositis vel pinnatis includens).

Type species : *P. pinnata* J. R. et G. Forst.

Nothopanax *Miq.* Fl. Ind. Bat. i. pt. 1, 765 (1855), emend. Harms in Engl. u. Prantl, Pflanzenfam. iii. Abt. 8, 47 (1894) (species foliis digitatis vel simplicibus includens) ; Dalla Torre et Harms, Gen. Siphonog. 363, n. 5864 (1903) ; Cheeseman, Man. N.Z. Fl. ed. 2, 633 (1925).

Lectotype-species : *N. cochleatum* (Lam.) Miq.

The following conclusions may be drawn from the study of the case of *Nothopanax*, and are here submitted for the consideration of botanists, in view of the preparation in the near future of " Regulations for determining types " for submission to the next International Botanical Congress.

1. Where an author, in publishing a genus containing more than one species, has failed to indicate a type-species or type-subdivision, it is open to a subsequent worker to choose a lectotype-species from those originally mentioned by name as belonging to the genus.

2. In choosing a lectotype-species, one of the guiding considerations should be the retention, as far as possible, of continuity in nomenclature.

3. Where part of the genus has been transferred to an earlier genus, the generic name should if possible be retained for the residuum.

4. The first choice of a lectotype is final, unless it can be clearly shown that it was made against the weight of evidence.

Harms's application of the name *Nothopanax* is in conformity with considerations 1–3, and his implicit choice of *N. cochleatum* (Lam.) Miq. should therefore not be reversed.

XVIII—PETROSAVIA AND PROTOLIRION.

J. Hutchinson.

In 1871 Beccari* published a description and drawing of a very interesting monocotyledonous plant from Mt. Poe, Borneo, and named it *Petrosavia stellaris* Becc., in honour of Dr. Pietro Savi, Professor of Botany, Pisa University. He referred his new genus to the family *Melanthaceae*, a group generally included as a part of *Liliaceae*. It was described as a parasite, and very remarkable in having an apocarpous gynaecium, a feature rarely met with in Monocotyledons, apart from *Alismaceae* and allied families, and quite unknown in *Melanthaceae*, or in a broader sense, *Liliaceae*. Bentham & Hooker, in the Genera Plantarum, included the genus with doubt in the *Liliaceae*, referring it to the tribe *Narthecieae*, wherein free styles sometimes occur ; and a similar position is maintained for it in both editions of Engler & Prantl's Pflanzenfamilien.

Early in the year 1891 Mr. H. N. Ridley discovered a plant in Perak, in the Malay Peninsula, which he determined from description to be *Petrosavia stellaris* Becc. He described it as a small yellow saprophyte. Mr. Ridley's material was studied in detail a few years later by the late Professor Percy Groom, who published his results in the Annals of Botany, vol. ix. pp. 45–58 (1895). On histological evidence he discounted Beccari's statement as to the plant being a parasite, and as Mr. Ridley also failed to find evidence supporting it, he concluded the plant was a saprophyte. Professor Groom pointed out that Mr. Ridley's specimens did not seem to agree exactly with Beccari's description, especially in regard to the carpels which Beccari stated to be " ex ima basi libera," whilst Professor Groom found them to be apparently connate at the base. Mr. Ridley therefore redescribed his Malay specimens as a new genus and species, *Protolirion paradoxum* Ridl., but unfortunately had not an opportunity of actually comparing his material with Beccari's type specimen.

In connection with my studies on the phylogeny and classification of Monocotyledons, I was struck with the great resemblance of Mr. Ridley's specimens at Kew and Beccari's figure, and through the courtesy of Professor G. Negri, Director of the Botanical Institute in Florence, the type specimen has been sent to Kew for examination. Beccari's specimen after dissection proves to be the same as Mr. Ridley's *Protolirion* from the Malay Peninsula, the bases of the otherwise free carpels being slightly immersed in and concrescent with the thick turbinate receptacle, exactly as described by Professor Groom.

The literature and records of the species are now as follows :—

Petrosavia stellaris *Beccari* Nuov. Giorn. Bot. Ital. iii. 7, t. 1 (1871) ; Ridley in Journ. Straits Branch Roy. Asiat. Soc. 1891, 170 ; Groom in Ann. Bot. vi. 380 (1892). *Protolirion paradoxum* Ridley

*Nuov. Giorn. Bot. Ital. iii. 7, t. 1 (1871).

in Ann. Bot. ix. 56 (1895) ; Groom. l.c. 45 ; Ridley Fl. Mal. Penins. iv. 322, fig. 195 (1914).

Malay Peninsula : not uncommon at 1000–3000 ft., in Gunong Tahan, Pahang ; Thaiping Hills, Perak ; Sungei Siput, Gunong Bubu, and Kedah Peak (see Ridley Fl. Mal. Penins. iv. 322).

Borneo : Mt. Poe, about 3000 ft., Aug. 1866, *Beccari* 2399 (type).

XIX—MISCELLANEOUS NOTES.

Charles Alfred Barber.—It is with deep regret that we have to record the death of Dr. C. A. Barber, who passed away on February 23rd, 1933. Barber commenced his scientific training when as a young man he was employed in the Liverpool and Manchester District Bank. During his leisure time he studied science, chiefly geology, and passed the First Science Examination of London University. In 1883, at the age of 23, he decided to abandon his commercial career and to devote himself to science. Regarding a knowledge of German as essential for a scientific student, he studied for a year at Bonn University, and then entered Christ's College, Cambridge, where he became a scholar. He passed both parts of the Natural Science Tripos with first class honours, taking Botany as his chief subject, and in 1889 was appointed University Demonstrator in Botany at the University. His work at this time and later was greatly enhanced by his facility as a botanical artist.

Two years later he accepted the post of Superintendent of the Botanical and Agricultural Department of the Leeward Islands and, after spending some time working at Kew, left for Antigua late in 1891. The lot of a scientific officer in a tropical Agricultural Department was not in those days a happy one, as he was expected to have a cure at hand for all the ills which affected the industry. Since he failed to do this, Barber's services were not fully appreciated ; the post was abolished by the local Legislature in 1895, and much useful fundamental research which Barber had carried out was wasted.

For some time after this he held the post of Professor of Botany at Cooper's Hill, until in 1898 he was appointed Government Botanist in Madras. His duties there included the Directorship of the Botanical Survey of South India, and for the first few years of his service he devoted most of his time to collecting material for the Madras Flora. Some time after his arrival in Madras, the attention of Government was drawn to the serious loss to Forest Revenues which was being caused by the " spike " disease of sandal, and Barber was called upon to investigate this. His careful research on the root parasitism of sandal and other species of parasitic plants is published in the Botanical Memoirs of the Department of Agriculture in India, and his work on this subject in particular qualified him for the degree of Sc.D.

His experience of the sugarcane crop while serving in the Leeward Islands was a great help to him when called upon to investigate the causes of the decline of the sugarcane industry in the Godavari district. With the thoroughness which was so conspicuous in all work which Barber undertook he decided that he could do no good until he had studied in detail the growing cane and all aspects of its cultivation. Accordingly he obtained sanction to open a cane-station in the Godavari delta. Later on, he opened two other stations in connection with investigations which he was called upon to make into the causes underlying the decrease in the acreage of groundnuts and into the causes for " pepper wilt " in the Wynaad. He thus obtained an insight into many aspects of arable and plantation agriculture under tropical conditions.

In 1912 he was appointed by the Government of India to the post of Sugarcane Expert and immediately set about studying the morphology and habit of the Indian canes, especially those of N. India. The results of this work are published in a series of Botanical Memoirs of the Agricultural Department in India entitled " Studies in Indian Sugarcane." The main objective of this study was the production of superior varieties to suit the short growing season of N. India, and this he accomplished by crossing Indian canes with the wild *Saccharum spontaneum*. The fact that Bremer's work in Java on the cytology of Indian cane varieties supports Barber's classification based on morphological characters alone is a remarkable tribute to the accuracy of the latter's work.

In 1918 the Honour of Companion of the Indian Empire was conferred on him and he retired in 1919. The rest of his life he spent in Cambridge, where for several years he held the post of Lecturer in Tropical Agriculture at the University.

The Madras Presidency owes a deep debt of gratitude to Barber for the part he played in laying the foundations of its Agricultural Department and in training so many of its officers. He was a good friend to all who knew him well, and was ever ready to place his knowledge at their disposal.

The New Botanical Laboratories, University of Toronto.— The new Botanical Laboratories at Toronto University were formally opened on June 8th, 1932, in the presence of the Prime Minister, the Chancellor of the University, the Chairman of the Board of Governors, the President, and a distinguished gathering of visiting botanists, together with Prof. R. B. Thomson and his botanical staff. The occasion was also happily marked by the conferment of the honorary degree of Doctor of Science on Prof. A. C. Seward, who was representing Great Britain as an invited guest at the ceremony. The Report of the opening, which has just reached us, gives an interesting account of the ceremony, when the Prime Minister, Mr. G. S. Henry, unlocked the door and delivered an introductory speech. The Chairman of the Board of Governors,

the Hon. Dr. H. J. Cody, followed with an outline of the history of the department and a description of the new building. Sir Robert Falconer then greeted the visiting delegates and called upon Prof. Seward, Dr. Wiegand, Cornell, Dr. H. T. Güssow, Ottowa, Prof. Marie-Victorin and Prof. F. E. Lloyd to address the meeting. The proceedings were terminated by brief speeches from Sir William Mulock and Dr. Cody.

The building is a stately Renaissance edifice, built of stone from the Credit Valley and Queenston. It consists of a basement, ground floor and two floors above, and is provided with an ample number of lecture rooms, laboratories, research rooms, a library and all the other requirements of an up-to-date botanical institution.

Closely connected with the new building a fine range of plant houses has been erected, consisting at present of seven good greenhouses for cool and tropical plants, ferns, orchids and succulents, with the necessary ranges for propagation and experimental work. As far, therefore, as glasshouses are concerned, Toronto now possesses the nucleus of a botanic garden valuable both for research purposes and for the instruction and edification of the general public.

Prof. Thomson is to be warmly congratulated on the successful realisation of the plans which he has had in mind for so many years, and the University of Toronto is also to be congratulated in possessing as fine a botanical institute as may be found in any other centre of learning and research.

Natural Varnish Resins.—An interesting collection of natural varnish resins has recently been presented to Kew by Mr. T. Hedley Barry, Consulting Chemist, author of a newly published work on this subject. The specimens comprising this collection have been procured by the donor from different parts of the world during the course of many years' work on the chemistry and origins of natural resins, and they have been utilized in supplying much of the data that is incorporated in the new volume. As Mr. Hedley Barry has exercised great care in ascertaining the correct botanical identity of his specimens—no light task with so many resins occurring in little-developed tropical countries—and has secured the co-operation of forest officials and botanists in the various countries of origin in obtaining material, his collection, which has been arranged as a special exhibit in Museum No. 1, is regarded as a very valuable one.

The new work,* containing nearly 300 pages, expands and brings up-to-date the information contained in an earlier treatise on natural resins by the same author. It is divided into two parts, the first of which deals with the history and botanical origin of resins and their physical and chemical properties in general. In the second part individual resins are dealt with and a chapter is devoted to each

*Natural Varnish Resins, by T. Hedley Barry, Ernest Benn Ltd., London, 1932. Pp. xxiii+294, ill. 84. Price 42*s.* 0*d.* net.

group. Among the large number of photographs that are reproduced there are many that are of special interest, for example those of resin-yielding trees in their natural habitats. Several maps showing the detailed distribution of resins accompany the text, and references to literature are given.

The natural resin industry has undergone great changes in recent years. Many that appeared on the markets in former years are now no longer exploited. On the other hand among certain grades production has been increased. Many of these changes are no doubt due to the competition that has arisen by the production of low-priced synthetic resins. It is fitting, therefore, that, at this stage, a comprehensive work embracing the whole field of natural varnish resins should appear, for it is probable that much of the information incorporated might otherwise have passed unrecorded or remained inaccessible. The author has obviously carried out a large amount of careful research in its compilation and the work constitutes a valuable contribution to the knowledge of the subject.

The Protection of Wild Flowers.—Under this title the Wild Plant Conservation Board has issued a pamphlet, mainly for the use of schools, dealing with the preservation of our native flora. The causes of the diminution of many of our wild flowers are discussed, and special emphasis is laid on the part that can be played by both teachers and pupils in preserving our flora for posterity. The pamphlet can be obtained from the General Secretary, the Council for the Preservation of Rural England, 17 Great Marlborough Street, W.1, at a cost of 1*s.* 6*d.* per dozen, if ordered in bulk; single copies will be supplied free to individual teachers who apply, enclosing postage.

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